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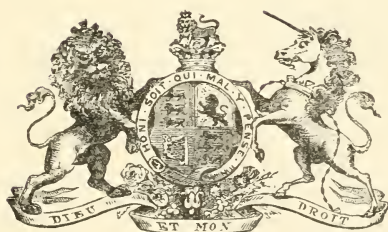
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ROYAL SOCIETY
OF TASMANIA

FOR THE YEAR

1916

With 5 Plates and 28 Text-Figures.



ISSUED FEBRUARY 19th, 1917.

PUBLISHED BY THE SOCIETY.

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The responsibility of the statements and opinions in the following papers and discussions rests with the individual authors and speakers; the Society merely places them on record.

THE ROYAL SOCIETY OF TASMANIA

The Royal Society of Tasmania was founded on the 14th October, 1843, by His Excellency Sir John Eardley Eardley Wilmot, Lieutenant Governor of Van Diemen's Land, as "The Botanical and Horticultural Society of Van Diemen's Land." The Botanical Gardens in the Queen's Domain, near Hobart, were shortly afterwards placed under its management, and a grant of £400 a year towards their maintenance was made by the Government. In 1844, His Excellency announced to the Society that Her Majesty the Queen had signified her consent to become its patron; and that its designation should thenceforward be "The Royal Society of Van Diemen's Land for Horticulture, Botany, and the Advancement of Science."

In 1848 the Society established the Tasmanian Museum; and in 1849 it commenced the publication of its "Papers and Proceedings."

In 1854 the Legislative Council of Tasmania by "The Royal Society Act" made provision for vesting the property of the Society in trustees, and for other matters connected with the management of its affairs.

In 1855 the name of the Colony was changed to Tasmania, and the Society then became "The Royal Society of Tasmania for Horticulture, Botany and the Advancement of Science."

In 1860 a piece of ground at the corner of Argyle and Macquarie streets, Hobart, was given by the Crown to the Society as a site for a Museum, and a grant of £3,000 was made for the erection of a building. The Society contributed £1,800 towards the cost, and the new Museum was finished in 1862.

In 1885 the Society gave back to the Crown the Botanical Gardens and the Museum, which, with the collections of the Museum, were vested in a body of trustees, of whom six are chosen from the Society. In consideration of the services it had rendered in the promotion of science, and in the formation and management of the Museum and Gardens, the right was reserved to the Society to have exclusive possession of sufficient and convenient rooms in the Museum, for the safe custody of its Library, and for its meetings, and for all other purposes connected with it. .

In 1911 the Parliament of Tasmania, by "The Royal Society Act, 1911," created the Society a body corporate by the name of "The Royal Society of Tasmania," with perpetual succession.

The object of the Society is declared by its Rules to be "the advancement of knowledge."

His Majesty the King is Patron of the Society; and His Excellency the Governor of Tasmania is President.

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PAPERS
OF THE
ROYAL SOCIETY OF TASMANIA
1916.

THE EARLY TASMANIAN PRESS, AND ITS
STRUGGLE FOR FREEDOM.

By Herbert Heaton, M.A., M. Comm.; Lecturer in History
and Economics in the University of Tasmania.

(Read 11th July, 1915. Issued separately 17th March, 1916.)

The figures in brackets refer to the notes at the end of
this paper.

It would be quite impossible to deal at all adequately with the early history of our press in anything less than a substantial volume. During the first fifty years of the colony, at least forty newspapers made their humble bow to the Tasmanian public. There were weeklies, fortnightly, monthlies, and quarterlies; there were sporting papers, teetotal advocates (1), church newses, and Irish exiles' leaflets (2). One marvels at the sublime faith in human intelligence exhibited by the founders of this multitude of publications, and one smiles at the unmercenary idealism of their introductory editorials. Each new editor, who was often an old one renovated, appeals to the sound common-sense and progressive sympathies of every right-thinking man in the colony. The motto of the paper is to be principles rather than personalities, criticism without cant, praise without adulation, truth and justice wherever they may be found. And in nine cases out of ten, the subsequent history is tragically similar. A non-reading or an apathetic public, a few subscribers who received copies and never paid for them, an occasional advertisement obtained only by offering a specially low rate; a few issues, perhaps a dozen or a score at most, and then, without any warning, a silence. Journalistic failures bestrewed the path of

Van Diemen's Land's progress, and their starved young corpses lay on the roadside, or were gathered up, and decently interred in the vault where the Chief Secretary's records are now stored.

Of these transient newspaper enterprises I intend to say no more in this paper. Our chief consideration will be with the more permanent successes, and we shall attempt to trace the line of journalistic succession, thanks to which Tasmania has been well supplied with news from 1816 to the present day.

The colony had not been long in existence before the first news-sheet made its appearance. In the early part of 1810, six years after the foundation of Hobart, the *Derwent Star and Van Diemen's Land Intelligencer* was issued. Governor Collins had brought out with him the type and a very primitive press, in order to be able to print Government notices, etc. He handed this stock-in-trade over to Messrs. Barnes and Clark; the Deputy Surveyor-General was appointed editor, and the paper was kept carefully under the Governor's supervision. The journal, the size of half a sheet of foolscap, printed on both sides, was issued fortnightly, and cost two shillings a copy. Its contents were chiefly Government announcements, but advertisements, shipping news, and other odds and ends, were inserted if space permitted.

This first effort was doomed to failure. The population of the island cannot have been more than a thousand white folks, and of these not more than a sixth could be regarded as constituting the reading public. Hence there was a very small possible circulation, and even at two shillings a copy it would be difficult to meet expenses. Still, the paper struggled on for a few months, but it was a hopeless task, and before the end of the year the venture expired.

A similar failure was experienced in 1814, when the *Van Diemen's Land Gazette* collapsed after nine fortnightly appearances (3). Two years more were to elapse before a paper appeared which surmounted all initial difficulties, and established itself permanently. This was the *Hobart Town Gazette and Southern Reporter*, the first issue of which was made on Saturday, June 1, 1816. It was printed by Andrew Bent, a man to whom great honour is due as the father of the Tasmanian press. Bent was apparently an illiterate man, to whom reading was no easy task. But he possessed just those qualities of keen business insight, dogged perseverance, and ingenuity, which were essential in press enterprise of that time. He seems to have come to an arrangement with Lieutenant-Governor Davey, by

which the *Gazette* was to be the official organ for the publication of Government notices. In return, he was to receive a small annual subsidy from the authorities, and the paper was to be entirely his own property. Any space available when the Governor's demands had been met could be filled up with general news, advertisements, etc.; but the Governor was to have a final voice in the choice of editor, thus exercising a kind of censorship. On this understanding Bent set to work, obtained a small supply of type and a press, and the first number appeared in due course, to be followed regularly by an issue every Saturday. Bent's trepidation does not appear on the surface, but eight and a half years later, in the first number for 1825, he tells of the fears and doubts entertained at the outset. "Our type was so limited that we could not compose at once more than is contained in one of our present-sized columns. There was no printing ink in the colony, but what we were necessitated to manufacture in the best possible manner for ourselves, and common Chinese paper, no more than half the size of foolscap, and of which two sheets were consequently obliged to be pasted together for each *Gazette*, cost two guineas sterling per ream! Exclusive of all these things, where was the public, whose cash, correspondence, and countenance are necessary to support a weekly press? Where could readers be found, except in some thirty or forty dwellings? Was it likely that a paper could flourish, where the only intelligence bore reference to crime, and the usual records were of infamy? It was not!" Whether possible or not, Bent decided to take the risk (4).

The first number (5) is of some interest. A single sheet, 11ins. by 7ins., printed in two columns, on one side of the paper only. It is "Published by Authority," and bears the royal arms, with the lion and the unicorn fighting for the crown. Underneath comes an official intimation of Government support:—"His Honor the Lieutenant-Governor has thought proper to direct that all public communications which may appear in the *Hobart Town Gazette and Southern Reporter*, signed with any official signature, are to be considered as official communications made to those persons to whom they may relate. By command of His Honor,

"THOMAS ALLEN LASCELLES, Secretary."

Then follows a notice of a festive character. Tuesday, 4th June, is the anniversary of the King's Birthday, and is, therefore, to be regarded as holiday throughout the settlement. The troops will parade in front of Government House at noon, and fire a "Feiu de Joie" (*sic*), followed

by a salute of twenty-one guns from the artillery. "The Deputy Assistant Commissary-General will cause to be issued to each of the Non-commissioned Officers and private Soldiers one Pound of Fresh Meat and Half a Pint of Spirits, to drink His Majesty's Health. The Deputy Assistant Commissary-General will also cause to be issued to the several Superintendents, Overseers, Constables, and other Persons in the actual Employ of the Government one Pound of Fresh Meat and Half a Pint of Spirits each on the above occasion. The Government Mechanics and Labourers will be exempted from work on Tuesday next." Evidently life in the early days was not a quite unbroken round of joyless toil.

Immediately underneath follows the welcome announcement that there is on sale at W. Presnel's store, in Collins Street, a quantity of the best Brazil tobacco at 7s. sterling per pound. An account of court proceedings comes next, and this, along with two items of shipping news, exhausts the local information. Two-thirds of the second column are still to be filled, and the editor takes refuge in publishing "Anecdotes of Frederic the II., the late King of Prussia," anecdotes which redound greatly to the heart and head of that monarch, but have no direct bearing on the affairs of Hobart Town.

Such are the tidings presented to the eager public by Bent's first issue. No. 2 is more attractive; the King's Birthday has come and gone, so there is plenty to record. A spirited account of the jubilations is given, ending as follows:—"At Six o'Clock in the Evening a sumptuous and splendid Dinner was given at Government House, at which were present the Officers, Civil and Military, the Commanders of the different Ships in the Harbour, and the Gentlemen of Hobart Town and its neighbourhood. Hilarity and loyalty pervaded every Breast, and the hours passed with the utmost conviviality." At least twelve of the gentlemen present were in the proper frame of mind and body to do justice to such a banquet, for immediately underneath the above paragraph, we read that on the morning of the same day, "a FOOT RACE between Twelve Gentlemen took place on the Road to New Town, . . . a distance of two miles; the first Six Gentlemen that gained the goal were to be the winner of a Dinner, to be given by the unsuccessful competitors" (6).

Apart from such trivialities, there is little local news in the early issues. Presumably, as was the custom in the newspaper world at that time, local events were supposed to be either too well known to be chronicled, or not worth recording. Hence the only Tasmanian news tells of

sensational events, such as the depredations of the bush-rangers, the movements of the aborigines, murders, thefts, elopements, or the drowning of messengers while fording flooded streams. The weather occupies much space each week. We hear of settlers selling their wives in order to obtain stock for their farms (7); we watch the rapid progress of horse-racing towards universal popularity; we learn that very big rats are swarming over parts of the island, biting children in their sleep (8), and this information is followed by an infallible recipe for rat poison. Persons over seventy years of age marry (9). A tradesman away up country receives a draft for £20, and adds a cipher to make it £200. When charged with forgery, he admits the act, but justifies it by saying that when he was at school he was told that a cipher stood for naught, and so he considers it extremely hard that for *nothing* he should be charged with a capital offence (10). As the paper expanded from two to four columns, voluminous quotations from English and Sydney papers were inserted, the English news being four to six months old. The aftermath of Waterloo was recorded at great length; Napoleon and St. Helena formed favourite subjects; the fate of Murat and Ney was depicted with gruesome details, and encomiums on Wellington, in prose and poetry, were always welcomed. The people of Hobart were given dazzling pictures of the introduction of gas lights into London (11), and on the death of any member of the Royal Family, the paper appeared with a deep black border. Columns of "Hansard" were reproduced when the House of Commons had been discussing colonial matters, and in the issue of April 5, 1817, appears a very interesting extract from the Report on the Condition of the Distressed Poor in England. At that time the fears concerning French designs on Australia had abated for a time; but England, with her innate love of "scares," decided that Russia intended to take up the ambitions of France. The possibility of a Russian descent on India and Australia was seriously discussed by English politicians and writers. Hence, when the Parliamentary Committee suggested remedies for England's poverty and distress, it urged the importance of encouraging emigration to New South Wales and Van Diemen's Land, for the purpose of populating the southern lands, and also to provide a "*point d'appui* against the encroachments of Russian aggrandisement." This section of the report was quoted at length in the *Gazette* as soon as the document reached Hobart.

Apropos of this Russian scare, it is interesting to note that in 1823 the *Gazette* recorded the visit of two Russian

discovery ships to Hobart. In the issue of 31st May we read: "Yesterday morning His Imperial Russian Majesty's Discovery Ships, the *Creuzer* and the *Ladoga*, put into our port to refresh, having been three months from Rio de Janeiro." The visitors stayed three weeks, during which time they were banquetted by the military officers and merchants, and, eventually, on the 21st June, they "proceeded in prosecution of their voyage of discovery." Where the discoveries were to be we are not told, nor does the subsequent history of Australia give any record of a Russian attempt to annex any part of the continent. But it is quite possible that this Russian roving commission was allied to the fear of French schemes on West Australia, which brought about the English settlements at Albany and the Swan River in 1825-1831.

One of the chief interests of the *Gazette* lay in chronicling the progress of the island, and the discovery of its latent resources. Bent and his editor were ardent believers in a "Big Tasmania." They were convinced that Van Diemen's Land possessed all the necessities required to make it a second England, and their columns were always open to any correspondent who had news or suggestions likely to assist in the development of the colony. Thus, in the second issue, we are told of the discovery of a fine coal seam on the Gordon River; the seam is six feet thick, providing "an inexhaustible mine of coal," the mouth of which could be within ten yards of the water's edge. Having published this account, the editor goes on to survey the known mineral resources of the colony. Coal has been found in many parts, slate and limestone are at our very doors, whilst marle and lime, invaluable for farmers, are here in abundance. On the strength of these discoveries, the writer compares Tasmania's resources with those of New South Wales:—"These are natural advantages the country of Port Jackson doth not possess, and which will enable the Agriculturalists of Van Diemen's Land to carry on their Agriculture to much greater success than the Inhabitants of Port Jackson will ever be able to do, as neither marle nor limestone have hitherto been found on the eastern side of the Blue Mountains" (12). This strong sense of the superiority of our island over New South Wales was to a great extent justified at the time. Tasmania had been eminently successful in the production of wheat, and in normal years produced far more than was necessary for its own requirements. It seemed very probable that the colony was destined to be the granary of Australia, and possibly the workshop as well. Witness the editor's comments on June 29, 1816:—"25,000

bushels of wheat have already been exported to Port Jackson out of the late harvest, and still there is enough and to spare for our own needs. From this earnest of industry and fertility in so young a colony, and with so small a population, the mind is led to contemplate on its prosperity and happiness at a remote period, when agriculture shall be brought to a state of perfection; when a population more than is requisite for the purposes of agriculture will support the Arts and Commerce, extended through their means; when fair Science and the Liberal Arts will rear their heads, and all the benefits of political society be universally felt." Look at the greatness of Rome; her strength was based on agriculture: every successful empire has been built up on the foundations of prosperous husbandry. "So proud an example ought to stimulate us to persevere in agriculture. All is in our favour, Climate, Soil, Manures, etc. Our wheat has already found one Market for its superabundance, and more is likely to be soon opened to us. Our Barley can be made into beer, to the great benefit of the country, and it is to be hoped that every other article of Produce will find a vent. 'Ye generous Britons, venerate the Plough,' is the exhortation of the Melodious Bard." A fine editorial, and read with approbation by many a free settler in the island. But such sentiments were distinctly unpalatable to Sydney, and when the editor of the *Sydney Gazette* took up the cudgels against his Hobart rival, a wordy warfare ensued. There were few journalistic niceties in those days, and the blows struck were hard and merciless. The Hobart editor succeeded in keeping his temper, though with difficulty, and eventually on December 24, 1824, he complained of the "ill-bred and waspish personalities" of the Sydney writer, and the "little jealousies arising from the HOURLY DEVELOPING SUPERIORITY OF TASMANIA."

There was little real cause for jealousy, for both colonies were making steady progress. To this progress the *Hobart Town Gazette* contributed very materially. In an age when scientific literature on agriculture was scarce in Tasmania, the *Gazette* rendered great service by publishing articles of prime importance to settlers on the land. In the fifth issue (13) appeared the first instalment of an article on the possibilities of growing hops in the island. This article began on the note of temperance, a note which always found a welcome hearing in the *Gazette*. The consumption of spirits was very great (14), a fact responsible for many of the problems which confronted the authorities. The *Gazette* fought against the liquor trade year after year, and many quaint articles and diagrams on

temperance can be found scattered about its pages. The article on hopgrowing begins: "How much more delicious to the parched and thirsty Labourer in the field in Harvest Season would be the cheering and sparkling cup of Ale to the draught of grog! What sums of money would be left in the Colony, or applied to other uses, was Ale and Beer the general Beverage! What excesses would be avoided, and crimes less likely to be committed! It would be to the interest of every Settler to endeavour to have a Barrel of good Ale in his House, instead of Gallons of Rum." For these reasons, the writer, "*Pro Bono Publico*," details at length (through six issues of the *Gazette*) the best methods of cultivating the hop. The article had great effects, and within six or seven years hop gardens and breweries were numerous in the southern part of the island. Similar contributions dealt with the growth of corn, the destruction of pests, the rearing of sheep, etc., and great attention was devoted by the *Gazette* to fostering the export trade in wool. In short, the *Gazette*, though small in size and circulation, strove to exert a powerful influence for material and moral progress.

With the growth of the paper came an increase in the number of advertisements, and from the advertisement columns one gets, perhaps, the best picture of the social and economic conditions existing in the settlement. Over all there loomed the shadow of the system; one can never for a moment forget that the island was, as Henry Melville called it, "a gaol on a large scale" (15). The Government notices and the court proceedings, the lists of tickets-of-leave and of escaped prisoners, all keep the grim sternness of the life before our eyes. And yet, partly because of, and partly in spite of, the system, a flourishing little commercial society was arising. The prisoners, the officials, and the troops, had to be fed, clothed, and housed, and the increasing number of free settlers made the demand for a variety of commodities comparatively great. Scarcely a month passed without the arrival of some sailing ship from the Old Country, bringing passengers, mails, and general cargo. One watches the size of the vessels creep up from 200 to 500 tons, and the length of the journey diminish from six months to four. American and Dutch boats were frequent visitors, and the Hobart-Sydney trade was growing rapidly, especially in wheat. It is interesting to note in passing that one of the best-known vessels here was the *Lusitania*. She was a boat of 250 tons, which did the outward journey from London in four and a half months. She was advertised as offering "superior accommodation for Passengers," and an advertisement in

the *Gazette* for August 16, 1823, reads like an announcement of the attractions of her ill-fated descendant:—"For London direct. . . the regular trader *Lusitania*. . . Her accommodations for passengers are very superior, and to those who may be sending their children to Europe to be educated, a desirable opportunity is offered, the passage of several being already engaged; female attendance will be provided, and every attendance paid them."

The advertisements of houses and land have a familiar modern ring about them. There are "highly eligible plots of land," "farms with never-failing creeks," and "very commodious weatherboarded houses" or "substantial brick-built houses pleasantly situated." But the tradesmen's notices are the most interesting. The specialised store, keeping only one sort of commodities, did not emerge until the late thirties. Up to that time the general store or warehouse held the field. The storekeeper received mixed consignments from England or elsewhere, and then inserted a half-column announcement in the *Gazette*, drawing attention to his wares. For instance, to take an advertisement from the *Gazette* of May 17, 1823, Mr. Deane informs the public at large that "the following valuable articles are just landed from the late arrivals, and will be offered for sale at the usual low prices." Then follows a list of over one hundred commodities, including calicoes, muslins, blankets, a fresh assortment of ladies' false curls, fine split-straw bonnets, a large assortment of books, consisting of Shakespeare's Plays, Humphrey Clinker, Tom Jones, The Self-interpreting Bible, Peregrine Pickle, Watts' Divine Songs, etc., ironmongery, Jews' harps, tea by the chest, rice and pepper by the bag, Jamaica rum by the cask.

In trading the currency problem was very acute, all manner of coinage being in use. English money was in circulation, but along with it were Spanish dollars, and rupees, and all seem to have been accepted with equal readiness in payment of bills. Thus, the *Australian Almanack* was published at "Three Rupees" (16); the *Van Diemen's Land Almanack*, issued in 1824 by Bent, was priced at one dollar (17), and advertisements for lost property generally offered a reward in dollars. But even with this mongrel coinage the currency was inadequate, and simple barter had to be adopted. Mr. Deane, whose list of goods has been quoted, was willing to take wheat at 8s. per bushel, wool, skins, seal-skins, and all colonial produce as payment (18). Another trader announced (August 10, 1816), that he had seven casks of Virginia leaf tobacco for sale; that he would allow three years' credit, and that payment could then be made in wheat or meat at storehouse

price. Farmers away inland generally made purchases in large quantities, receiving credit on the security of the next harvest, with the result that some of them smoked and drank away their whole crop before it was harvested. Even passage money was occasionally paid in produce, and one often encounters notices like the following:—"It being the intention of Captain Dixon to touch at Rio de Janeiro, wheat will be taken for payment of passage money either to Rio or to England" (19).

To the housewife many interesting statements as to the prices of commodities are scattered up and down the early numbers of the *Gazette*. The prices of imported articles, especially those on which duties were imposed, were high. Tea ranged from 8s. to 15s. a pound, sugar 1s. per lb. Tobacco was obtainable at 6s. to 12s. per lb., whilst rum stood at 20s. a gallon, and one gallon of rum passed for currency in many parts as equivalent to £1 sterling. Fresh butter cost 5s. per lb. The housewife's chief trouble lay in the price of bread. The price was fixed by assize; this assize was supposed to be revised weekly (20), in accordance with the prevailing price of wheat or flour, but such revision was not done at all effectively. Hence, even in times when wheat was cheap, the price of the loaf remained high. This discrepancy drew forth the following editorial protest in the *Gazette* of June 11, 1824:—"The glaring disproportion between what our bakers pay for their wheat and what we have to pay for our bread at length compels even us to murmur. Surely our worthy magistrates will deign to interfere, and in their equity to modify the assize, that those who lean on the staff of life as well as those who prepare it may find support."

The above picture is that presented to us by the *Gazette* during the first eight years of its life. Those years had comprised a momentous period in the history of the journal. Week after week it had been issued regularly, slowly extending its circulation. There had been many difficulties to overcome. The first was that of type. The supply available when Bent began was very small, and if by any chance a special demand was made for a large supply of one particular letter, difficulties arose. Bent was short of small "a's." Therefore, he had to use italics, capitals, and ordinary letters indifferently, producing a very strange effect on the printed page, as for instance, in the third issue, where the words "pAyment" and "severAl" occur. Again, his supply of capitals was small; hence when he had to set up a number of short Government notices, the capitals were exhausted long before the heading of the last notice was reached, and "government house,

hobart town, saturday" was printed devoid of a solitary capital letter (21). It was many months before a larger supply could be obtained from England. With the arrival of Governor Sorell, in 1817, the amount of Government matter increased, and soon the single sheet had to be supplemented by a second one. At times four sides were covered with print, and when a death occurred in the Royal House, five or six sides were required in all to make room for the obituary notices. By 1818, all type difficulties had been overcome. Small pictures of ships and houses began to grace the advertisement columns. The size of the paper was increased to large foolscap, and three columns per page became the rule. Even then it was often necessary to add a second sheet, and this four-page production was a really creditable piece of work. In April, 1821, Governor Macquarie visited the island, and Bent celebrated the event by publishing an "Extraordinary" in mid-week, the first "Special" published in the island (22). By this time Bent was ready to do copper-plate printing; he published a school primer and spelling book, and acquired a stock of copybooks from England, with which he supplied the schools that were now being formed. The newspaper improved every month, and at the beginning of 1824 it became a four-page paper, with four columns per page, excellently arranged and printed. In 1823 the press had been moved into larger premises in Elizabeth-street; bookbinders' tools had been obtained, and Bent was now a publisher, stationery dealer, and bookbinder. He therefore conceived the idea of issuing the *Van Diemen's Land Almanack*, which made its appearance in 1824; it was a creditable little volume, sold at 5s., and was the ancestor of *Walch's Red Book* of present fame.

When the difficulty of inadequate type had been removed, Bent found another problem before him, one not nearly so easy to solve. The settlers, especially those in the Midlands and North, had welcomed the *Gazette*, and Bent, with his usual diligence, spared no pains to see that the copies reached their destination. But when the first quarter's accounts were sent out, many of the settlers disregarded them. Just as the doctor's bill is the last to be paid to-day, so was the printer's bill the last to receive attention then. The settler obtained his rum and tobacco on three years' credit; why not his paper on the same terms? For a time Bent did not press his claims, but eventually, in 1819, it became necessary to state "that unless his demands (were) regularly adjusted quarterly he must unavoidably relinquish his endeavours to supply the *Gazette*" (23). Two years later (1821), the same trouble

arose, and Bent inserted the following in his columns:—"The Printer of this Paper takes occasion to request a settlement of accounts from those indebted to him. Some of the accounts alluded to, he begs to remind, are for papers since the commencement, and having escaped recollection year after year, really ought to be paid without the trouble that accompanies the necessity of a legal application. He, therefore, trusts that this timely request will give such subscribers an opportunity to prevent him from resorting to so unpleasant a measure, and that they will speedily come and pay for their papers" (24). Not they! The appeal had very little effect, and Bent put matters into the hands of his lawyer; the cases were brought into court, and the defaulters ordered to pay. Even then many ignored the verdict, and after waiting a month, Bent stated that he would be willing to accept payment in wheat (25). This had some effect, but year after year the same trouble arose. Bent cut off the supply of papers, and began to demand payment in advance. In 1824 some farmers promised to pay after the harvest, and then failed to keep their promise (26). Bent threatened and cajoled; if they refused to pay, the court would compel them; if they did pay, the printer would not only feel thankful, but would make them each a present of an *Almanack* (26).

Amidst such difficulties, Bent plodded on, and built up an excellent business. In the first issue of 1824, he surveyed with satisfaction his past struggles, and indicated his ideas for expansion. The paper now had sixteen columns, of which Government notices and advertisements took up more than one half. The rest was filled with local news, Sydney notes, and English extracts. Bent felt the time had come to admit the public to his columns, and he therefore announced as follows:—"We have often had occasion to remark that the small scale of our paper hitherto would not admit of our inserting Correspondent's letters. . . . As our columns will now allow of the insertion of more matter, and as the well-informed part of the community might be disposed to fill up a leisure hour in communicating through the Press the result of their knowledge, observation, or practice, on subjects important to the interests and pursuits of the Colony, we now feel a pleasure in having it in our power to state that our enlarged paper will henceforth enable us to give publicity to all communications which may appear useful or interesting to our readers" (27).

Bent little realised that in issuing this invitation he was opening the gate to the floods of misfortune which assailed him very soon. He had not long to wait for the

correspondents. They were of two kinds, versifiers on the one hand, political and agricultural authorities on the other. Of the would-be poets, a few sent lines which well deserved the publicity afforded them, and original poetry became quite a feature of the *Gazette*. But of the great majority, the editor mercifully committed their efforts to oblivion. In every issue appeared a short section in which the editor replied "To Correspondents." The editorial pen was often dipped in gall to write this section, and the verdicts on the poets were severe:—

"W. had better attend to the ducks and geese and swine he speaks of than attempt poetry."

"Our enlightened correspondent, 'E.H.T.,' need not be offended at our rejection of his 'Alphabetical Reminiscences,' as they were considered uninteresting merely because they were too classical for ordinary readers."

'Lines on Beauty' are so utterly devoid of it that in pity to 'Lothario' we shall burn them."

"We are sorry to tell 'A Philosopher' he is ignorant of mankind."

"'Vurses on Kangeru Huntin' by a Stockkeeper, are no doubt very fine, but they are above our comprehension."

"We have no wish to blight the hopes of our Correspondent who signs himself 'A Bud,' yet in the Muses' bower we seriously think he will never prove a Blossom."

Whilst the poets were turned away, the letter-writers were accorded a more favourable reception. At first the letters were perfectly harmless. Political criticism was scarcely ever attempted, for Lieut.-Governor Sorell was a universal favourite, and it is doubtful if there were a dozen settlers in the island sufficiently dissatisfied with his rule to pen a letter. Hence the correspondence was chiefly commercial and agricultural. The growth of tobacco, frauds in weights and measures, faults in the currency, the need for a central market, or for a museum of natural history, these were the staple topics, discussed by writers with such perennial pseudonyms as Agricola, Rusticus, An Old Settler, Patriot, Constant Reader, Another Constant Reader, Britannia, Colonist, Veritas, etc. The *Gazette* welcomed such contributions as good "copy," and a number of the letters contained valuable agricultural advice.

Then the change began, and soon Bent's sky was full of dark clouds. On 15th March, 1824, J. L. Pedder arrived from England to become the first Chief Justice of the newly-established Supreme Court, and Mr. J. T. Gellibrand came to become Attorney-General. Two months later, Col. Arthur reached Hobart, to take the place of

Sorell. The colonists did not welcome the new-comer. Sorell had been easy-going and affable. His rule had laid lightly on the free settlers, and he was no fastidious worshipping of elaborate organisation or regulation. On the other hand, Arthur's reputation was that of a stern soldier, with a high hand and an iron heel; a man keen on order, efficiency, and discipline; a man who, placed at the head of a colony which was a penal settlement as well as a home for free settlers, would rule it as a penal settlement, pure and simple. Such a man was bound to clash with the spirit which was manifesting itself among the free settlers. They were formulating demands for liberation from the control of Sydney, for trial by jury, and for representative government, demands which were not all compatible with the fundamental character of the settlement.

The trouble soon commenced. Immediately on his entry to office, Arthur appointed his nephew, John Montagu, Colonial Secretary, and drew round himself a circle of advisers and officials appointed almost entirely from amongst the new arrivals. He reorganised the prison system, tightened the discipline, and by a series of orders placed the whole penal and political life of the colony on a different footing. He seems to have paid little regard to those who had been the friends and advisers of his predecessor, and even less to the manner in which things had been done formerly.

Such an attitude promptly aroused opposition from those who thought themselves slighted, and this was reflected in the correspondence to the *Gazette*. When the new Governor arrived, Bent determined to shake himself free from such Government supervision as had formerly been attached to his paper. Up to this time, the editor had been appointed by the Governor, but Bent now dismissed the old editor, and appointed Evan Henry Thomas, a well-educated and fluent writer, in his place (28). Thomas soon began to venture an occasional mild protest against official sins of omission and commission, and passed for publication one or two letters in which the protests were more strongly worded. Chief amongst the critics of the Government was Robert Lathrop Murray, who wrote under the nom-de-plume of "A Colonist." Murray's letters usually filled three or four columns of the paper, and contained a few grains of wheat in the midst of a stack of chaff. There was plenty of vague generalising, largely much ado about nothing; but having read through the mass of words, one perceived dimly that "Colonist" had been criticising the new Governor. The editor, in publishing such letters, pleaded for greater brevity, and stated

quite clearly that personalities, invective, political or religious controversy would not be allowed to pass his censorship (29). To those who sent details of scandals, he replied: "If what you say is true, the Supreme Court is the fit place to reveal the facts, not a newspaper" (30). Such protests and disclaimers, however, did not placate the Governor. Veiled criticisms were being made in the press; they must be stopped. In June or July, 1824, therefore, Arthur endeavoured to assert his authority over the *Gazette*, by claiming it as Government property. Bent strenuously defended himself, declared that the paper belonged entirely to him, and sent Thomas, his editor, to lay the case before Arthur's superior in Sydney, Sir Thomas Brisbane. The verdict was entirely in Bent's favour (31), and in the *Gazette* of October 8, 1824, a mysterious and triumphant editorial revealed sufficient of the facts to allow the public to guess the remainder. This editorial was assumed by many to be a veiled attack on Arthur, but Thomas vigorously denied any such intention, in the following issue. "We bow down with all merited homage to the (representative) of our glorious Monarch," concluded the article, and in his refusal to publish anonymous attacks on officials, Thomas showed that he had no intention of being a bigoted partisan.

These protests were of little avail, for the new Governor had quickly decided that action must be taken against the *Gazette*. That determination grew as the editorials and "Colonist's" letters became bolder in their tone. First, the police force was criticised. Then complaints made in letters were enlarged upon. Editorials nearly all began now with such sentences as "Much general inconvenience is being felt," or "Repeated complaints have been made." Real or imaginary scandals in the employment of convict labour were dragged out, and the new harbour regulations were said to be ruining the port. "Colonist" laboured at great length to prove that Arthur had allowed himself to be misled by a host of evil and interested subordinates; that he had created a small army of sinecures for his friends, with big salaries and little work; that the colonial revenue was thereby being squandered, and that meanwhile farmers and merchants were trembling on the brink of ruin (32). The editor, possibly intoxicated by the vigour of this attack, wrote article after article in similar vein. He pleaded with the Governor (33) to do something "to re-nerve the drooping energies of Van Diemen's Land, and to eventually realise those sanguine expectations" which had brought the free settlers here. "If ever destiny decreed a crisis at which a smiling colony might either by Minis-

terial neglect be suffered to perish irremediably, or by Ministerial succours be restored to its *ne plus ultra* of elevation and prosperity, that crisis is at hand." The harvest had been deficient, but "Why should distress stalk through the furrowed vales of Van Diemen's Land" because the settlers had no seed, when the Government could easily obtain some and supply the farmers on easy terms? Still stronger words were to follow. On May 20, 1825, the editor made a fierce attack on Arthur's administration, concluding with the following sarcastic paragraph:—"It is much better that a few supine, ignorant, and extravagantly-hired Public Officers should be galled for their misconduct than that a whole community should be crushed, enslaved, and subjugated. Had the former administration of this Colony been anti-commercial, anti-agricultural, and anti-local in every sense, perhaps by this time our necks would have been seasoned to the yoke. . . . The truth is that Col. Sorell governed this Island with a fixed and amiable view to its elevation—that he reasoned before he presumed to act—that he acted in compliance with reason—and consequently that wealth in combination with improvement, respectability, and happiness, sprang up beneath the fructifying smile of his administration. But note well, has a transition, at once mischievous and melancholy, occurred since his departure? Have the merchants been insulted? And are the sons of husbandry abandoned? Has the public money, which ought to be always used in public improvements, been lavished on the worse than superfluous dependants of at most but a fleeting authority? Has public judgment been set at naught, and public feeling violated? Has proper intercourse between the governed and the Government been rudely curtailed and unwisely interfered with? These and numerous other truly caustic questions might now be advanced. Nevertheless, as our Monarch's delegate may yet become popular, if he will condescend to learn wisdom from experience, and henceforth legitimately exercise his power for the welfare of all who are committed to his care, we shall at present refrain from saying much which, though deserved, might give offence. . . . What we have said is well meant; what we have said is felt by the Public; and what we have said, if properly attended to, will render the heart of every honest Colonist a shrine of respect for Lieut.-Governor Arthur."

Flesh and blood could bear no more, and within a week Arthur's plans for retaliation were complete. Since Bent was not amenable to official pressure, the position of Government Printer must pass into the hands of some

more pliable person. Arthur discovered the desired character in George Terry Howe, son of the George Howe who in 1803 had established the *Sydney Gazette* (34). Howe had begun to publish *The Tasmanian* in Launceston early in 1825, but he was now approached by Arthur, and offered the post of Government Printer in Hobart. He was promised a subsidy of £300 a year, in place of the £30 which had been paid annually to Bent (35). Attracted by these terms, Howe came to Hobart, and after arranging a partnership with James Ross, LL.D., a brilliant Scotsman living in Hobart, he produced his first copy of the *Hobart Town Gazette* on June 25, 1825.

The name of the paper was frankly pirated from Bent, but the protests of the latter were met with the retort that the title was one which belonged only to the official organ of the Government, and that as Bent's paper had sacrificed its claim to official recognition, it had *ipso facto* lost its title. Bent eventually was compelled to accept the new situation, and in August his paper appeared under the name of the *Colonial Times*. Meanwhile the new *Gazette*, though printed at first in very inferior style, showed no penitence for its usurpation, and the two journals filled many columns flinging gibes and journalistic mud at each other. The *Gazette* took up an attitude of appreciation towards the Government, and sang the praises of Arthur's administration (36). A letter by "Colonist" which had formerly appeared in the old *Gazette* was reprinted, but with every "No" turned to "Yes," with "unsatisfactory" changed to "satisfactory," and with every criticism transformed into a commendation (37). Arthur could rely on the loyal support of his new printers, in spite of the editorial assertion that the opinions expressed in the new journal were "free and uncontrolled."

Having succeeded in this first attack on Bent and his supporters, Arthur now pressed on to the second. The rebel printer must be sued for libel. Out of the mass of anti-governmental utterances, two were selected. The first was the editorial which referred to the appeal to Sydney against Arthur's claim to the paper (38); the second related to statements made concerning Arthur's alleged misdeeds whilst Governor of Honduras (39). In commenting on the former incident, the editor had made a scarcely veiled reference to the Governor as a "Gibeonite of tyranny." The allusion, the exact meaning of which no one seemed to understand, was regarded as imputing some especially bad form of tyranny; and the second charge, to which a third was added subsequently (40), was based on the assertion that Bent had made imputations of tyranny,

corruption, and improper conduct against the Governor. Bent appeared before the Supreme Court several times, and, after prolonged trials and re-trials (41), was sentenced, on the verdict of a military jury, to six months' imprisonment, and to fines which, along with counsel's fees, amounted to £518 (42).

In the eyes of many free settlers this heavy punishment appeared to be flagrant persecution of a man who for ten years had struggled hard to keep the island provided with a newspaper. In July, 1826, a meeting was called of all "Friends of the Liberty of the Press," at which a subscription list was opened for Bent's benefit, and eventually Bent was recouped for his losses to the extent of about £250 (43). When liberated, the indomitable printer continued his former policy, with Murray ("Colonist") as editor of the *Colonial Times*. The paper became more than ever the organ of the malcontents, and the medium for scurrilous attacks on Arthur. No story was too bad to be true, and, according to the columns of the *Colonial Times*, the Governor and his minions were greedy, corrupt, tyrants, who were fast driving the colony into bankruptcy and revolt. Arthur meditated further reprisals, and early in January, 1827, ordered another prosecution for libel against Bent, who had reprinted from the *Australian*, a mainland paper, an extract which Arthur deemed to be personally offensive and libellous. Even the *Gazette* protested against this action (44), and the prosecution was withdrawn, in favour of measures for imposing legislative restraint on the whole press.

Arthur's attitude, though the cause of much vituperation at the time, calls for a certain amount of sympathy. He was in a difficult situation as the head of a colony which was at the same time a home of convicts and of free settlers. The free men, whose voices were heard in Bent's columns, were clamouring for the liberties they had enjoyed at Home, freedom of speech, freedom of the press, trial by jury, and representative responsible government. But the convict system made the granting of some, if not all, of these demands well-nigh impossible. Arthur's character and military training made him indifferent to such constitutional trifles. His business was to keep the convicts in order, and, as a secondary consideration, to develop the resources of the colony. But anything which militated against order amongst the convicts must be suppressed, even if it entailed the denial of citizenship to the free settlers. Hence, a perfectly free press, with the right to criticise as it pleased, was impossible. Discipline and quiet amongst the prisoners was the prime necessity ;

a free press was a mere luxury, and Tasmania had not yet reached the stage for luxuries. Arthur made his position clear to a deputation of fifty Hobart residents who waited on him in December, 1825, with a request for the suppression of disorder in the gaol and bushranging throughout the country (45). In his reply, Arthur pointed out that the cause of the outlawry and violence was to be found in the "factious principles disseminated in the colony through the medium of a licentious Press," the utterances of which had a disquieting effect on the convict population. "who, being for the most part men predisposed to evil, are unable to draw the necessary line between the liberty of writing and the liberty of acting, and who, seeing the Government insulted with impunity, and its measures characterised as the effort of weakness and imbecility, have been led to the delusive expectation that resistance to the constituted authorities might prove successful." The Hobart press, he declared, was "striving to alienate, as far as it was able, the community from the Government," and "tending to destroy the only rallying point on which the country could rest or from which it might reasonably expect to have its affairs retrieved" (46). In similar vein, Arthur declared about a year later that "so long as the colony was a place for the reception of convicts, the press could not be free: that it was dangerous to authority, and calculated to destroy the security of domestic life" (47). Arthur evidently presumed that the convicts could afford to procure copies of the paper (at one shilling each), and were able to read the printed word—both doubtful suppositions.

Holding the above opinions, Arthur now determined to gain more effective control over the press, through the agency of the newly-established Legislative Council. In New South Wales the freedom of the press, granted by Governor Brisbane in 1824, had caused much friction between the papers and the authorities, and Governor Darling was now attempting to regain control of the journalists. Arthur resolved to imitate Darling, and in September, 1827, the Legislative Council of Van Diemen's Land passed "An Act to regulate the Printing and Publishing of Newspapers, and for the Prevention of blasphemous and seditious Libels" (8 Geo. IV., No. 2) (48). The preamble stated the case for the Governor. The number of convicts was far greater than that of free settlers, and the colony was primarily a prison settlement. Newspapers had thrown off the official censorship, and had abused their freedom by publishing matter "calculated to diminish the due authority of the Government over transported

offenders. . . . and tending to bring the Government and the Administration into Public Hatred and Contempt.' Therefore, in order to stop the issue of the blasphemous and seditious libels, the Act decreed

(1.) That no person should print or publish a newspaper without having first obtained a license; this license was to be issued by the Governor, and must be renewed annually.

(2.) That if the licensee published any matter tending to bring into contempt or hatred the Royal Family, the Government or Constitution of the United Kingdom or of Tasmania, the license could be cancelled at once.

(3.) That each licensee should enter into a recognisance before the Chief Justice, along with two or three guarantors, the printer giving security to the extent of £400, and the others for a further £400, that no libel should be printed.

An accompanying Act (8 Geo. IV., No. 3) imposed a stamp duty of threepence per copy on all newspapers printed in the island, but allowed the Governor to reduce the duty at any time. Heavy penalties were to be imposed for printing on unstamped paper (49).

Armed with these Acts, Arthur felt secure, and at once refused to give Bent a license to print. The veteran printer tried various devices, including the publication of a sheet containing advertisements only; but at every turn the law pounced upon him, and he suffered heavily. At the same time, the *Gazette* ceased to print anything but Government notices, thus becoming an official notice-sheet and nothing more. Dr. Ross turned the non-official part of the old *Gazette* into a new paper, the *Hobart Town Courier*, in which he continued to pour out his wrath against the Radicals, and his mild flatteries of Arthur.

The passage of the newspaper Acts had been bitterly resented by the advocates of liberty, and a forcible protest, signed by fifty leading citizens, informed Arthur that the restrictions on the press were "needless, unconstitutional, and debasing—an insult to the colony, and contrary to the implied engagements of the Crown when emigration was invited" (50). Arthur gave an unsatisfactory reply, and the protest was therefore despatched to the Home authorities, with a request that the objectionable Acts might be disallowed. In December, 1828, the reply was received, supporting the colonists in their protest, and annulling both Acts (51).

Here ended the first phase in the struggle for liberty of the press. The result had been a partial rebuff for the Governor, who now for six years refrained from any

further libel suits. But in the struggle Bent had succumbed. He appears to have become bankrupt about 1827-8, and to have lost control of the *Colonial Times*. He made several spasmodic attempts at a later date, going to Sydney in 1835, where he published *Bent's News* in 1836, at the low price of threepence per copy (52). After four years this effort also failed; Bent lost his printing plant, and spent four years in destitution. In 1844 he issued a begging letter, asking for £50 to enable him to purchase a small press and set of type. The Australian papers took up his appeal, referring to him as the "scarred veteran of the Press," "the Father of the Tasmanian Press," and describing him as the

"Village champion, who, with dauntless breath,
The little tyrants of the place withstood."

Subscriptions flowed in. Governor Gipps sent £5; Chief Justice Stephen, who had been one of Bent's most bitter enemies in the 'twenties, forgot old feuds, and gave £4. But Bent was now evidently worn out, and, in spite of a long subscription list, he did nothing more for Australian journalism. His story is a pathetic episode in our early history, and his dauntless fights, often for men who, like R. L. Murray, were not worth fighting for, entitle him to a niche in Tasmanian history as a practical friend of progress and a political martyr. His epitaph can best be written in the words of an Australian editor who supported his begging appeal:—"One who has suffered so much persecution—the loss of personal liberty and property—in his praiseworthy efforts to expose the prevailing errors of the day, and to raise the tone of society" (53).

The struggle between Arthur and the press began its second phase in 1835. By this time many new figures had appeared, and the Radical party in Hobart had become strong, being organised in the "Political Association." The absence of trial by jury and of representative government gave the malcontents a splendid peg on which to hang their attacks on Arthur. The undoubted material progress of the colony was ignored by this opposition party; on the other hand, every action of the Governor was seized upon, twisted out of its real shape, and made the subject of long, scurrilous articles in the *Colonial Times* and *True Colonist*. The former paper was now in the hands of Henry Melville, a clever, but strongly partisan, writer. Melville was an ardent Radical, and, incidentally, a keen advocate of the "single tax," and of heavier taxation of unimproved land (54). The *True*

Colonist, which was published daily for a time, had as its editor a wild, headstrong journalist, Gilbert Robertson. Robertson had no appreciation of the need for verifying one's facts, and was always ready to print any story if it reflected adversely on the authorities. This unfortunate faculty eventually brought Robertson into conflict with Arthur, and in 1835 he was sued for four distinct libels.

The nature of these libels illustrates the general nature of the scores of accusations which the two papers were constantly bringing against the Government. The first was that Arthur had, after the enrolment of a grant of land, made a correction of a clerical error, with the imputation that if he could correct clerical mistakes, he might also commit more serious alterations in deeds, amounting to forgery. For this insinuation Robertson, who was unable to prove his assertion, was sentenced to four months' imprisonment and a fine of £60. The second libel was an accusation that the Governor had appropriated hay from the Government farm at New Town for his own private use, a charge amounting to larceny. This brought on Robertson's head a fine of £120, and eight months' imprisonment. The third libel was against Mr. T. W. Rowlands, attorney of the Supreme Court, and for this offence the unlucky editor received a sentence of £20 fine and one month's imprisonment. Whilst he was serving his accumulated period of thirteen months in gaol, a fourth charge was brought against him, that he had libellously attempted to defame the Governor and his nephew, Captain Montagu. Robertson had charged Montagu with having used a large quantity of Government materials and labour in building himself a "mansion" in Hampden-row, and afterwards, to cover his offence, had obtained an antedated letter of license from Arthur, sanctioning the use of such materials. This last case was tried before Judge Montagu, a relative of the plaintiff, and Robertson, who was unable to substantiate his charges, received a severe handling from both judge and counsel for the prosecution. The latter declared that the charge made by Robertson "was as false as if the Father of Lies himself had come up from the bottomless abyss, and communicated it to the *True Colonist*" (55). The judge, in sentencing him to twelve months' imprisonment and a fine of £50, used the most vigorous language. The libel was "false as hell," the editor was "the tool of a miserable party of agitated disturbers"; he was prostrating his intellect "in so debased, detestable, and abominable a service," and was publishing articles which were "a pest even to Botany Bay" (56).

Robertson, in his confinement in gaol, was soon joined by Melville, who was sentenced in November, 1835, to twelve months' imprisonment, £200 fine, and ordered to find securities to the extent of £500 for his future good behaviour. Melville's offence was contempt of court, he having commented on the judge, jury, witnesses, and sentence, in a very discreditable trial for cattle-stealing (57). Melville spent his time in prison writing a most unflattering history of Arthur's regime, in which he pleaded for land reform, the stoppage of transportation, representative government, etc. When Christmas, 1835, came round, the Governor graciously liberated Robertson, and on the 29th December set Melville free (58). Arthur accompanied his liberation of Melville with the expressed hope that the release "will lead you in future, by the influence of a better motive than fear of punishment, to abstain from a system of detraction which is not more injurious to the interests of your own family than it is subversive of all peace and order, and ruinous to the welfare of society." This hope of journalistic reform was doomed to disappointment, for both editors at once recommenced their bitter attacks, Robertson especially distinguishing himself by his wild and usually unfounded assertions.

After twelve years of service Arthur was recalled in 1836. On May 27 and 28 of that year, the papers were full of the news. The Radical press went into hysterics of joy and called upon every resource of type to announce the welcome fact. The *True Colonist* burst out in the following strain:—"Never has it fallen to our lot to communicate such welcome intelligence. . . . He (Arthur) will be wafted from these shores by the curses of many a broken-hearted parent, and many a destitute child, which owe their misery to the foolish and wicked system of misgovernment by which the colony has been ruined, and the vindictive system of persecution by which the prospects and characters of individuals were ruined. . . . He was the father of usury—the patron of falsehood, hypocrisy, and deceit—the protector of perjury, and the rewarder of perjurers." Robertson also in June (59) urged the public to refuse to support a fund which was being organised for the purpose of presenting Arthur with a piece of plate. "Yes, colonists," he concluded, "present Col. Arthur with a piece of plate, but let it be symbolical of (the colony's) present state—let it be a shivered fragment of crockery, and tell Col. Arthur that as the fragments can never be united, so has he dissevered society, and caused the colonists to be without union, save in one important point, and that is in thanking His Majesty for the mercy he has

manifested in the recall of Col. Arthur." When Arthur sailed, Robertson and a few of his fellow Radicals illuminated their houses in honour of the event, and persuaded a number of men and boys to let off fireworks in the street. The police intervened, and in the Police Court proceedings of the following day it was announced that Robertson had been arrested with his pockets full of crackers (60).

From such expressions of party hatred it is a relief to turn to the *Hobart Town Courier* (of which Ross was still editor), and the other papers which had supported Arthur's rule. Here we find nothing but praise of the administration, and sincere regret when Arthur was recalled. "Governor Arthur has made the colony," says Ross (61), and the long list of actual achievements shows that, in spite of many blunders, and a haughty manner, Arthur had been responsible for much real progress in the colony. If this was so, how then is one to explain the tirades of Melville and the Radicals? The explanation is that the press was conducted on strict party lines, perhaps even more so than to-day. The Radicals were the Opposition, an Opposition which had no power to voice its opinions in a Legislature composed entirely of the Governor's nominees. The only available channel for criticism or suggestions was, therefore, the press. But Arthur was an autocrat, who took no regard of the advice showered upon him, a fact which exasperated the Radicals to a great degree. Further, the settlement was isolated; news from the outside world filtered in only about once a month. The newspapers were, therefore, driven to fill their columns with local matter, and as this was difficult to accomplish, they sought refuge in virulent attacks on the Governor, who so completely disregarded their few just grievances. The journalistic conscience was practically non-existent; the laws of evidence were apparently unknown; the colonists must have value for their money. Therefore, the line of least resistance was to attack the administration, with a violence such as we have seen on several occasions above. Having gained a certain measure of liberty in 1828, the journalists drew no line between liberty and license, and their tactics were frequently nauseating. Arthur, after his initial attack of hyper-sensitiveness in 1824-5, learnt to ignore the constant jibes at himself and his subordinates, knowing full well that the Radicals would defeat their own ends by their unwise methods. Only when some accusation became too offensive did he seek the aid of the law, and on such occasions he was always sure that a military jury, or a specially chosen civil jury, could be relied upon to give a satisfactory verdict. It is an unpleasant story, and

Arthur cannot be excused at times of a certain vindictiveness in his actions, and of a wilful deafness to the demands of the more democratic free settlers. But the blame was not all on one side, and until Robertson and the rest had learnt the value of truth and moderation, such conflicts as have been described in this paper were inevitable.

With the arrival of Sir John Franklin, a more reasonable atmosphere was created, and the Radical press lost some of its venom. Melville occasionally figured in libel cases, the plaintiffs being private citizens, but the rancour of 1834-6 was gone forever. Meanwhile the *Hobart Town Courier* had passed in 1837 into the hands of Mr. Elliston, Master of the Longford Academy (62), who combined a gentle flattery of the Governor with eloquent educational articles, some of which urged the need for a University in the island. The idea of a University had been conceived some ten years earlier, but nothing had been done. Elliston now took up his pen to revive the demand, and in several splendid articles he pleaded for a University, no matter how small. Such an institution, he urged, would attract those who otherwise would go from Australia and India to England; it would produce good doctors and teachers; and "finally, by providing instruction in the higher departments of literature, independently of a professional kind, that character would be given to the wealthier classes of the colonists without which rank is intolerable, and the influence of wealth pernicious" (63). Perhaps also the University might have had a beneficial effect on journalists, and hastened the day when the oft-used phrase, "the licentiousness of the press," would be meaningless. That day came slowly, as the press began to realise a deeper sense of moral responsibility, and, as journalists, assured of liberty of speech, laid down as their ideal, "The truth, the whole truth (unless it hurts our case), and as little as possible beside the truth."

NOTES AND REFERENCES.

1. *Teetotal Advocate*, 1842.
2. *The Irish Exile*, 1850-1.
3. See Fenton, "History of Tasmania" (1884), p. 41.
4. *Hobart Town Gazette*, January 7, 1825.

5. The copies consulted for this paper are those in the keeping of the Hon. the Chief Secretary, to whom, and to whose staff, the writer wishes to express his thanks for the facilities rendered him in preparing this paper.
6. *H.T.G.*, June 8, 1816.
7. *H.T.G.*, October 19, 1816.
8. *H.T.G.*, November 30 and December 14, 1816.
9. *H.T.G.*, April 26, 1817.
10. *H.T.G.*, October 19, 1816.
11. *H.T.G.*, December 7, 1816.
12. *H.T.G.*, June 15, 1816.
13. *H.T.G.*, June 29, 1816.
14. It was estimated that in 1826, 1,000 gals. of rum were consumed weekly by a population of a little over 12,000. See *Hobart Town Courier*, November 18, 1836.
15. "A History of the Island of Van Diemen's Land from the year 1824 to 1836 inclusive; to which is added A Few Words on Prison Discipline"; printed at the office of Henry Melville, Hobart Town, Van Diemen's Land, 1835, p. 131.
16. *H.T.G.*, January 30, 1824.
17. *H.T.G.*, January 2, 1824.
18. *H.T.G.*, May 17, 1823.
19. *H.T.G.*, June 28, 1823.
20. *H.T.G.*, passim. See especially August 10, 1816, and ordinance regulating bread trade, July 6, 1816.
21. *H.T.G.*, June 15, 1816, and April 12, 1817.
22. *H.T.G.*, April 25, 1821.
23. *H.T.G.*, July 12, 1819.
24. *H.T.G.*, January 27, 1821.
25. *H.T.G.*, April 14, 1821.
26. *H.T.G.*, February 27, 1824.
27. *H.T.G.*, January 2, 1824.
28. See evidence in trial, *King v. Bent.*, *H.T.G.*, July 30, 1825; also *Colonial Times*, April 15, 1826.
29. *H.T.G.*, June 4, 1824, and subsequent issues.
30. *H.T.G.*, January 14, 1825. See also comment in *Gazette*, January 21, 1825:—"The Angler would fish in troubled waters, but we will not let him."
31. See evidence in trials, July, 1825, and April, 1826.
32. See letters, July 30, September 3, 1824; January 28, February 25, April 22, 1825.

33. *H.T.G.*, April 22, 1825.
34. *H.T.G.*, May 27, 1825.
35. See annual statements of accounts before and after 1825.
36. Ross acted as editor, and for the rest of Arthur's regime was his most stalwart supporter.
37. *H.T.G.*, June 27, 1825.
38. *H.T.G.*, editorial of October 8, 1824.
39. *H.T.G.*, February 11, 1825.
40. *H.T.G.*, April 8, 1826.
41. *H.T.G.*, July 1, July 30, 1825; April 1, April 22, May 20, May 27, 1826. Also *Colonial Times*, especially April 15, 1826.
42. *Colonial Times*, August 4, 1826.
43. *Colonial Times*, July 28, 1826.
44. *H.T.G.*, February 17, 1827.
45. *H.T.G.*, November 28, 1825.
46. *H.T.G.*, December 19, 1825.
47. Fenton, *op. cit.*, pp. 77-8.
48. Both Acts are printed in full in the *Gazette*, September 22, 1827.
49. The duty was soon reduced to twopence.
50. Melville, *op. cit.*, p. 70.
51. Melville, *op. cit.*, p. 70.
52. *Hobart Town Courier*, January 22, 1836.
53. These facts are obtained from a collection of cuttings from various Australian papers, which are pasted in the front of the Chief Secretary's copy of the first volume of the *H.T.G.*
54. In his History, referred to above, Melville deals with the whole question of land tenure. Here he urges that the whole revenue of the colony should be raised by a land tax or quit-rent; customs, stamp duties, and other existing forms of taxation could then be abolished. Further, he suggests that in a land tax unimproved land "should be more severely taxed than the soil on which labour and capital have been expended; the former has been almost useless to society, whilst the latter has assisted in the maintenance of the inhabitants," pp. 151 et seq.
55. *H.T. Courier*, July 7, 1835.
56. For the facts of these four cases, see Melville, *op. cit.*, pp. 199-203. Also *H.T. Courier*, March 9, April 7, May 5, July 7 and 8, 1835.

57. Melville, *op. cit.*, p. 230. Also *H.T. Courier*, November 6, 1835.
58. *H.T. Courier*, December 25, 1835. Also January 1, 1836.
59. Quoted by *H.T. Courier*, June 10, 1836.
60. *H.T. Courier*, October 31, 1836.
61. *H.T. Courier*, May 27, 1836.
62. *H.T. Courier*, December 9, 1836.
63. *H.T. Courier*, March 24, 1837; also June 23, 1837.

NOTES ON THE GEOLOGY OF THE CRADLE MOUNTAIN DISTRICT,

With a Bibliography of the Pleistocene Glaciation of
Tasmania.

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Plates I.-IV.

(Communicated by W. F. D. Butler, M.Sc., LL.B., B.A.)

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Owing to the kind invitation of Mr. Rodway and Professor Flynn, the writer had the good fortune to be a member of a party spending the last week of 1915 in Mr. Weindorfer's Accommodation Hut near Cradle Mountain in the north-west of the Tasmanian highlands. Though there was little opportunity for detailed geological work, many interesting features were observed, which, at the request of the leaders of the party, are here recorded, and correlated with the scattered references to this region in the writings of the few geologists that have previously been in the neighbourhood. A sketch map of the geological features, and a topographical sketch map are also given, based on a manuscript map by Franz Malscher, supplied by Mr. Weindorfer, and amended in accordance with surveys made by the present party. The following account must be considered rather tentative, since lack of time prevented complete verification.

Cradle Mountain may be reached most easily by the road from Sheffield through Wilmot and the Middlesex Plains, a distance of forty miles. The track crosses the Isis River and Pencil Pine Creek, and then follows the Dove River to the foot of the mountain. The formations traversed by this route, or adjacent thereto, are the Pre-cambrian schists, the Cambrian sandstones, quartzites and conglomerates, Silurian limestones, Devonian granite, and Tertiary basaltic rocks (which are of several types, varying from dolerite to tachylite), and alluvial deposits.⁽¹⁾

The four main formations in the vicinity of Cradle Mountain and Barn Bluff are the Pre-cambrian schists and quartzites, the Permo-carboniferous conglomerates, sandstones and mudstones, the Cretaceous dolerite, and

(1) W. H. Twelvetrees. Bibliography No. 42.

the Pleistocene glacial deposits. A little recent alluvium is also present. The general disposition of the first three series is roughly indicated in Mr. Johnston's official Geological Map of Tasmania of 1884, the earliest chart to which the writer has had access. A more accurate representation is found in the map given by Jeffrey Smith, "based on information supplied by the Geological Survey of Tasmania." (2).

The Pre-cambrian rocks of the region have been briefly described by Messrs. Waller⁽³⁾ and Ward.⁽⁴⁾ The latter remarks that at Barn Bluff they strike a few degrees north of west. Between here and the Forth River the strike, according to Waller, is nearly east and west. In the immediate vicinity of Cradle Mountain the writer found the strike to be between E.N.E.-W.S.W. and N.N.E.-S.S.W., the former direction predominating to the north-east of the mountain; while to the north-west, along the Dove River, rocks have been observed striking west of north. Evidently there is a great bend in the Pre-cambrian fold-axes in this region. The rocks are intensely folded; numerous sharp anticlines and synclines are visible. The dips are nearly vertical, and easterly dips are usually steeper than those directed towards the west, while the latter are more common. These facts suggest that overfolding has occurred under the influence of a thrust directed from the west.

The rocks present are all of sedimentary origin. They include dark grey phyllite, coarsely crystalline mica-schist, micaceous quartz-schist, feldspathic quartz-schist, and schistose quartzite, showing abundant evidence of recrystallisation, and, indeed, passing locally into vein-like masses of quartz. True veins of quartz traverse the other rocks, occurring lenticularly in the bedding-planes or running obliquely thereto. Four samples have been examined microscopically; the following are brief descriptions of the same, using the terminology adopted by Grubenmann⁽⁵⁾:

1461. Puckered Phyllite (helicitic texture). This consists of a granoblastic ground mass of quartz-grains, with wavy bands of finely-divided carbonaceous matter, sericite, and bleached biotite, the whole more or less stained with limonite.

(2) *A Naturalist in Tasmania*. London, 1909.

(3) See Bibliography No. 21.

(4) L. K. Ward. *Contributions to the Geology of Tasmania*. Systematic Geology. The Pre-cambrian. Proc. Roy. Soc. Tas. 1909.

(5) *Die krystallinen Schiefer*. Second edition, 1910.

1464. Mica-schist with a lenticular schistose texture consisting of granoblastic quartz, with large irregular porphyroblasts of orthoclase, generally blackened by inclusions of carbonaceous matter. These have resisted the shearing much better than the quartz, and are a frequent cause of the irregularity of the lenticular texture. A pale green mica is abundantly developed in the numerous shearing planes, and extends out from them. Sericite is also present, and a very little andalusite and rutile.
1465. Mica-schist with lenticular texture, consisting of long irregular lenticles of close-packed pale green weakly pleochroic mica, partially chloritised, separated by layers of granoblastic but more or less elongated quartz grains. Large porphyroblasts of feldspar, generally orthoclase, but also albite, interrupt the continuity of the lenticles of mica and quartz. Inclusions in these often continue the planes of schistosity. Small grains of magnetite are scattered throughout the rock, and a few grains of andalusite have been noted.
1466. A much crushed schistose quartzite, exhibiting perfectly the klasto-porphyrific structure. It consists of large quartz-grains with very undulatory extinction and shattered margins, a few irregular uncrushed grains of albite, and a ground mass of finely comminuted quartz, with a few shreds of sericite.

All these rocks are characteristic of the uppermost zone of Grubenmann's classification of the crystalline schists. This bears out Mr. Ward's view concerning their nature.

The Permo-carboniferous rocks lie on a very uneven surface of the crystalline schists. The irregularity is particularly clear under Mount Brown, on the southern side of Rodway Gorge. The basal portion of the series consists of conglomerate containing pebbles derived chiefly from the Pre-cambrian series, but also from the Devonian granites and other formations. They pass up into pebbly sandstones and mudstones. A thickness of about seventy feet of conglomerate occurs beneath the north end of Cradle Mountain, but this increases considerably to the south and east. There is apparently not less than five hundred feet of the sediments beneath Mt. Brown, while

Mr. Montgomery records the presence of a thousand feet of sediment beneath Barn Bluff. The basal beds at the last locality comprise a hundred feet of conglomerate, followed by two feet of cannel coal, enclosed in black micaceous shale containing *Glossopteris (ovata?)* and *Noeggerathripsis* sp. Above this lie nine hundred feet of marine mudstone, shale, sandstone and conglomerate similar to those occurring at Mt. Pelion, nine miles to the south-east, which contain such typical Permo-carboniferous fossils as *Fenestella*, *Spirifera*, *Productus*, *Aviculopecten* and *Stenopora*.⁽⁶⁾ Mr. Waller has estimated the series at Mt. Pelion to be from a thousand to fifteen hundred feet thick.⁽⁷⁾ Thus the Permo-carboniferous basin becomes deeper towards the south-east, and many of the outcrops show a slight tilt in that direction.

At the surface in contact with the overlying dolerite, the mudstones are more or less altered, silicified and indurated. Small veinlets of opal traverse the bands of black carbonaceous shale. The alteration does not extend more than about a foot from the dolerite. It is well exposed on the northern face of Barn Bluff.

The Cretaceous dolerite caps Mt. Brown, Barn Bluff, and Cradle Mountain. It has the same general characters as the Mesozoic dolerite in other parts of the island, and may be considered to be portions of sills once continuous with the dolerites of the Pelion Range. Waller affirmed this former continuity, but doubted the intrusive character of the dolerite.⁽⁸⁾ An examination of the base of the dolerite on the northern face of Barn Bluff, however, shows that it transgresses to a small extent across the bedding planes of the mudstones; and in the case of Cradle Mountain the dolerite rests on sandstones in the southern end, but on the underlying basal conglomerate on the northern. No feeding dykes were observed, but attention might well be directed to the north-eastern foot of Cradle Mountain, where, as seen from a distance, the dolerite appears to pass down through the Permo-carboniferous rocks, to come into contact with the Pre-cambrian schist. (See Plate 3.) The dolerite on Barn Bluff is about 650ft. thick, that on Cradle Mt. 700ft., but that on Mt. Brown is perhaps not more than 300ft. Columnar structure is very pronounced in the two former masses; but in places the predominance of one direction of vertical jointing causes instead a platy structure.

(6) See Bibliography No. 13.

(7) See Bibliography No. 21.

(8) Op. cit. *supra*.

The petrological character of the dolerites is of interest. They are of medium grainsize, and consist predominantly of plagioclase and pyroxene. The plagioclase forms small, more or less, idiomorphic tabulæ, somewhat zoned, the central portion having the composition of bytownite. The pyroxenes are more varied, a rhombic and two types of monoclinic pyroxene are present. In a rock from the lower portion of the dolerite on Cradle Mt. (1458) there is a normal, more or less, ophitic augite (some times subidiomorphic), with the usual large optic axial angle, associated with, and frequently including prismatic crystals of enstatite. In a rock from the summit of the mountain, however, the monoclinic pyroxene, which is partly subophitic, partly subidiomorphic, has two distinct types, namely, those grains which have the normal optic axial angle (which are in the minority), and those which are approximately uniaxial, indicating that they contain a large excess of magnesian silicate, i.e., are magnesium-diopside, or the augite-enstatite of Wahl. This mineral has been previously recorded in the dolerite of Cataract Gorge by Osann ⁽⁹⁾, and is known to be fairly common in other occurrences of dolerite in Tasmania. ⁽¹⁰⁾ In both these rocks, there is a small amount of magnetite and of very finely crystalline intersertal granophyre, dotted with crystallites of magnetite. The former of these rocks contains grey felspathic veins at first thought to be granophyre. They prove to have a highly ophitic to poikilitic texture. The pyroxenes are sometimes roughly prismatic, ophitic or broken up into isolated patches, which are in optical continuity over quite large areas. The pyroxene is quite fresh, usually uniaxial, but sometimes of the normal character. There are, in addition, small prisms of enstatite. The felspar is slightly zoned, has the general composition Ab_1An_2 , and forms a few small phenocrysts. Between the tabulæ is a small amount of minutely crystalline granophyre. A few large grains of magnetite are also present.

Two inches from the chilled margin of the dolerite of Barn Bluff the rock is very fine-grained, with an intersertal structure. It contains small phenocrystic laths of plagioclase and larger prisms of augite, more or less converted into chlorite and carbonates. At the margin itself, the grainsize is extremely minute, and the texture appears to be subvariolitic. Both these rocks contain vesicles

(9) Ueber einen Enstatitaugit-führenden Diabas von Tasmanien. *Centbl. für Min.*, 1907, pp. 705-11. Translation by W. H. Twelvetrees *Ann. Rep. Dept. Mines, Tas.*, 1907.

(10) J. A. Thomson, *Journ. and Proc. Roy. Soc. N.S.W.*, 1911, p. 306

filled with quartz, carbonates, and hæmatite. There is a remarkable absence of magnetite and of glass.

The Pleistocene and Recent deposits will be best considered with the general physiography, which we now proceed to discuss.

The writer is indebted to Mr. Twelvetrees's report on the adjacent Middlesex district for an account of the general relation of the physiographic features to the regional topography of Tasmania. He states, "The entire area is an elevated plain or tableland, dissected by stupendous gorges, and diversified by residual mountain ranges." He indicates that the tableland is separated by faults near Mt. Roland and Bell Mt. from the lower plateau near Sheffield and Wilmot, and lies at an elevation of 2,200-2,600ft. in the neighbourhood of Middlesex. ⁽¹¹⁾ It rises gradually to the south-west, and around Cradle Mt. it lies about 4,000ft. above sea level. The plateau has here cut across the uneven surface of contact of the Pre-cambrian and Permo-carboniferous rocks, so that the surface of the plateau consists of irregular areas of the two formations. The more siliceous Pre-cambrian rocks rise in small residuals, but the three dolerite mountains form the greatest monadnocks. The plateau is trenched by the great gorges of the Forth River and its tributaries, to the east of Cradle Mountain, and by the gorge of the Fury on the west. The effects of the Pleistocene glaciation are everywhere visible, and to these we will devote special attention.

Six periods may be recognised in the development of the present topography. In the first, possibly early Tertiary period, the dolerite-sills were laid bare by erosion, and a roughly horizontal surface of erosion or peneplain was produced in the dolerite. An uplift followed of more than a thousand feet, and the present peneplain-surface was cut out of the older level, fragments of which remain as residuals, such as Cradle Mt. and Barn Bluff. A mature system of valleys was originated between these, and, in particular, the course of the Forth River was outlined. The third period was one of oscillatory uplift, accompanied by gentle tilting. The numerous immense gorges of the Forth and Pieman River systems were produced by revival of the ancient matured valleys. Tributary gorges such as Hanson's, Rodway's, and the Fury cut themselves right back to the foot of the residual mountains, while others, such as Smith's Creek and the Dove River, and Pencil Pine Creek, were considerably deepened in their

(11) Bibliography No. 42.

lower portions, but the gorges had not cut back to the heads of the streams. During this period of alternating uplift and aggradation, flows of basalt occurred on several occasions outside the special area here considered. The oldest basalts, with their intercalated gravels, cover Middlesex Plains, and were probably connected with those above Lorinna on the other side of the Forth Gorge (as shown by Mr. Twelvetrees). The upper portion of the gorge is a wide, open valley, in which there is a thick mass of gravel covered with basalt. Below this there are newer gravel terraces, and the present stream has cut down below these, thus giving a perfect example of a valley-in-valley topography. (See Bibliography 42, Plate IV.) According to Mr. Andrews's view, the gravels were probably deposited during periods of subsidence between the successive uplifts. ⁽¹²⁾

The remaining periods are those of maximum glaciation, retreat of the glaciers, and finally the period of post-glacial erosion. Possibly further research will show that the period of maximum glaciation comprised two or more maxima with intervening periods of retreat, as has been determined for the glaciation on the mainland, ⁽¹³⁾ but there is not sufficient evidence to permit of this conclusion at present. The period must here be considered as a whole.

Glacial features have been noted in this region by Sprent (3), Montgomery (9, 13), Waller (21), Twelvetrees (31), and Noetling (38), but no detailed description has been given. At the time of maximum glaciation an ice-sheet extended over the whole region, the three main prominences being probably the only points emerging above the snow. The main directions of ice-flow were determined by the pre-glacial valleys that were roughly radial about Cradle Mt., but important overflow-glaciers were developed as the level of the ice rose, and adjacent streams became confluent. In describing the manner in which these influenced the topography, we commence at Barn Bluff. The ice moved radially from this peak. To the west it fell over the gorge of the Fury, and was there broken up and melted. It does not seem likely that any mass of ice moved down this valley, since it appears to be a typical water-worn valley with overlapping spurs. To the south-east the ice moved out on to the plateau, scooping out the broad and probably shallow

(12) E. C. Andrews. *Geographical Unity of Eastern Australia*. Journ. and Proc. Roy. Soc. N.S.W., pp. 420-480, especially p. 455.

(13) David, Helms, and Pittman. *Proc. Linn. Soc. N.S.W.*, 1901, pp. 26-74. David. *Ibid.*, 1909, pp. 657-668.

basin of Lake Will, at the foot of the Bluff. North-east of the Bluff the ice-sheet moved across the plateau and fell into the gorge of the Forth River. Numerous small lakes were developed, such as Windermere and Agnew, their position probably depending on differential erosion, the mica-schists, and the soft Permo-carboniferous sediments being easily picked out. The ridge running to the south-east from the Bluff separated the northerly from the southerly flow, and is heavily cumbered with morainic material. Plucking of blocks of rock out of their original position must have gone on to a great extent, for one finds large blocks (up to 16 by 11 feet in area) of comparatively fragile coal measures, lying among the debris (Montgomery 13).

The eastern side of the ridge joining Barn Bluff and Cradle Mt. is broken into a great cirque with minor embayments, which surround the heads of tributaries of the Forth River. The ridge consists of horizontal sediments lying on the ancient rocks, which form the floor of the broad and relatively shallow cirque. Its eastern side has been sapped back into a continuous cliff. The floor is heavily glaciated and littered with morainic material. To the east the glacier from this cirque joined the ice-sheet on the plateau and fell over into the Forth River Gorge. West of the connecting ridge there is little sign of glaciation, the surface sloping regularly down into the Fury Gorge. Possibly the dominant west wind prevented the accumulation of much snow on this slope. ⁽¹⁴⁾

East of Cradle Mt. is the grandest example of a cirque in the district. On its floor is the lake for which the name Lake Rodway has been suggested. It lies in a broad and deep trough, around the head of which rises the crescentic ridge of Cradle Mountain. It is probable that the name of the mountain was derived from the resemblance this trough and rim-ridge bear to a miner's cradle. The crescentic form of the ridge is due to the cirque eating deeply into the eastern side of the original monadnock, while the western side has been scarcely affected; a further instance of asymmetry. The cirque is not simple, but is broken into four steps, by transverse bars of quartzite. (See Plate 3.) The "treads" of the two upper steps are narrow, the third is broader, and bears a small shallow lake, the outlet of which falls over a strongly glaciated bar into the main basin of Lake Rodway, the depth of which has not been ascertained. A

(14) Compare G. K. Gilbert. Systematic Asymetry in the High Sierras of California. *Journal of Geol.*, 1904, pp. 570-586.

broad glaciated bar follows, beyond which the stream falls directly into Rodway Gorge, which is a water-cut canyon. The boundary between the glaciated and water-cut surfaces is sharply marked. To the south, the main basin was extended by a cirque, cutting back into the soft Permo-carboniferous rocks of the ridge joining Cradle Mt. and Mt. Brown. This cirque, however, does not contain a lake, and is separated from Lake Rodway by a long moraine.

In the period of maximum glaciation, this great trough must have been filled to overflowing with ice, which was more than a thousand feet deep. Overflow-glaciers made their way over the northern rim of the trough, bearing boulders of dolerite, now scattered erratically. Once over the ridge, they broke up, fell down into a small gorge, were more or less recemented there, and, joined by the overflow-glacier from near the outlet of Rodway Lake, they scooped out a little rock basin before finally falling into the canyon proper. This little basin may be aptly named the Hidden Lake. The passage of the overflow-glaciers has cut the northern ridge, bounding the great trough, into a succession of cross-ridges of quartzite and hollows cut in mica-schist.

North of Cradle Mt. lies Dove Lake, a deep rock basin formed by the enlargement by glacial erosion of the upper part of the Dove River. The ice from the plateau and the north-western face of Cradle Mt., a total area of about 1,000 acres, collected in the head of the stream, passed down a steep fall on to a "tread" 400ft. below the plateau, where Lake Wilks was cut out. A second tread was formed near the lake-level, after a further fall of about 300ft. The further effect of the ice is shown by the soundings. (These were measured from a raft in a strong breeze, and must be considered as rough approximations only, both in depth and position.) The upper end of the lake is a basin at least 108ft. deep, separated from a basin almost 200ft. deep by a quartzite ridge (at one point only 72ft. deep, but rising into islands). The shallow point (48ft.) beyond the second basin probably marks a ridge connecting the quartzites of the great promontory with those of Mt. Campbell, on the opposite side of the lake. Beyond it is another deep (144ft.), separated by a quartzite ridge and islet, from the westernmost basin (46ft.), in which the Dove River ice was joined by the overflow from Crater Lake. The outlet stream passes over a drift-covered plain, probably concealing a rock-bar. Further soundings of this lake are very desirable.

In addition to this moulding of the floor of Dove Lake, the smooth curve of the eastern wall was rounded out by the middle portion of the glacial stream, while above, overflows made their way to the north-east. A large flow went past the northern end of Cradle Mt. to join the ice in the Rodway Valley, a second passed over the ridge south of Hanson's Lake, scooping out the little group of tarns there. A third passed over the gap into Hanson's Valley, converting the head of the valley into a lake basin. The contrast between this beautiful cirque-lake and the rugged water-cut gorge below it is very striking. These three overflow-glaciers were 400ft. above the present level of Dove Lake. At the northern end of Dove Lake overflows of ice passed across the watershed and dolerite boulders may be found high up on the slopes which lead down into Smith's Creek.

Lake Lilla owes its origin to the flow of ice that came down from the Crater Lake. It is a shallow pan, the greatest depth found being 45ft. The ice escaped from here over a rock bar into Dove Lake. An interesting feature is the almost complete removal of the old divide between Lake Lilla and Dove Lake, the ridge between the two lakes rising only thirty feet above the level of Dove Lake. (See Plate 4.) The outlets of the two lakes are separated by a beautiful *roche moutonnée* hill. The various strata cross this diagonally, and the surface of the hill, otherwise quite smooth, is pitted with jagged hollows, containing lakelets, and marking spots where vast masses of rocks have been plucked out by the moving glacier. No better examples of this process could be desired than are to be seen here.

Crater Lake is another most interesting feature, clearly exhibiting differential glacial erosion. Its southern end is a great cirque-wall rising more than five hundred feet above the lake, and cut into a mass of rather soft felspathic schist between quartzite bands. The lake is here 203 feet deep. The centre of the lake is crossed by a bar of quartzite only 30ft. below the surface. This bar continues to the north-east of the lake, forms the small knoll near the outlet, and extends down to cross the outlet of Lake Lilla. The side of the knoll is polished and grooved by the ice-stream from Crater Lake, which passed down into Lake Lilla. The gap by which this stream escaped from the Crater Lake basin has been filled by a ridge of morainic material which now rises about a hundred feet above the lake. The northern portion of Crater Lake contains two basins, as shown

by the soundings, and the outlet passes over a rock-bar, and enters Cradle Valley as a stream hanging nearly 600ft. above the base of the main valley.

Another well-marked cirque appears on the northern side of Cradle Valley, about a mile above the accommodation house. It is cut down out of Hounslow Heath to a depth of about 700ft., and enters the main valley almost at grade. There is a little morainic matter in the floor of this cirque, but no lake. No well-marked cirque occurs at the head of the Cradle Valley, which has, nevertheless, been greatly modified by glacial action. It is a broad, deep, steep-sided valley. The glacier which filled it received tributaries from the Crater, Lilla and Dove valleys, and escaped in part by the present Dove Valley, but also a large overflow passed over the col and down Smith's Creek. Dolerite-erratics have been traced down the Dove River about half a mile below Cradle Valley, and about a mile down Smith's Creek, and probably extend to the commencement of Smith's Gorge a mile or two further down.

No detailed study has been made of these terminal regions, in which the complex record of retreat and advance may ultimately be deciphered. There seem to have been small gorges cut in the older glaciated valleys, and some sign that these have been subsequently occupied by ice, but it is not clear whether this is the work of interglacial river action or merely of subglacial streams. The well-timbered character of these valleys prevents the observer from obtaining a general view of the whole.

The last stages of the period of glacial retreat were responsible for the moraines in Cradle Valley. Typically hummocky moraine fills the lower part of the valley and extends across into Smith's Creek. A lateral moraine extends along the southern side of the Cradle Valley, rising 250ft. above the floor. An arcuate terminal moraine closes the outlet of Lilla Creek, and a thin ridge of moraine extends down towards the outlet of Crater Lake, possibly a remnant of a small terminal moraine. It is interesting as showing the mark of an overflow-channel fifty feet above the present outlet. Small masses of morainic material occur in most of the cirques mentioned.

The final period of post-glacial erosion has had very small results. Some morainic material has been removed, and small outlet valleys notched in the terminal moraine, and patches of alluvium have been formed.

Summarising, we may say, that though the glaciers here were large enough to overflow, their valleys, there is

no evidence that they extended far to the north, but occupied only the comparatively mature upper portions of a rejuvenated river system, and did not extend beyond the heads of the canyons which then reached to within a few miles of their source. In the gorge of the Fury, which had been cut back almost to its source, no sign of glaciation was observed.

The writer is indebted to all the members of the party for assistance in various ways, especially in raft-building and sounding. Mr. Butler's and Mr. Maxwell's photographs have been most useful in the preparation of the paper. Mr. Butler has provided the amended copy of Malscher's map, which is the basis for the geological map herewith, and Mr. Twelvetreets has kindly discussed with the writer some of the questions here raised and added items to the Bibliography. To his father, Mr. W. Benson, the writer is indebted for Plate 3 herewith, based on photographs, sketches and descriptions. Plate 4 is from a photograph by Mr. Spurling, of Launceston.

BIBLIOGRAPHY OF PLEISTOCENE GLACIATION IN TASMANIA.

(References to Textbooks omitted.)

1. 1855-65. Chas. Gould. Observations of glaciation on the Central Plateau, verbally communicated, and cited by R. M. Johnston in 1893. Also, Report on the Exploration of the Western Country. Tasmanian Parl. Papers, 1860. No. 6.
2. 1883. T. B. Moore. Exploration—Report on the country between Lake St. Clair and Port Macquarie. Tasmanian House of Assembly Journal. Paper No. 56.
3. 1885. C. Sprent. Recent Exploration on the West Coast of Tasmania. Trans. and Proc. Geogr. Soc. Australia, Vict. Branch. Vol. III. p. 58.
4. 1886. F. W. Hutton. On the supposed Glacial Epoch in Australia. Proc. Linn. Soc., N.S.W. Vol. 1885 (1886), pp. 334-41.
5. 1887. R. M. Johnston. Observations with respect to the Nature and Classification of the Tertiary Rocks of Australasia. Proc. Roy. Soc. Tas. pp. 135-207.

6. 1888. R. M. Johnston. The Geology of Tasmania.
7. 1893. E. J. Dunn. Remarks on the Glaciation of Tasmania in a Victorian newspaper; also, Glaciation of the North-Western Highlands of Tasmania. Proc. Roy. Soc. Vic., Vol. VI., pp. 133-38.
8. 1893. T. B. Moore. Discovery of Glaciation in the vicinity of Mt. Tyndall in Tasmania. Proc. Roy. Soc. Tas., 1893 (1894), pp. 147-9.
9. 1893. A. Montgomery. Glacial Action in Tasmania. Ibid., pp. 159-169.
10. 1893. R. M. Johnston. The Glacial Epoch of Australasia. Ibid., pp. 96-103.
11. 1893. G. Officer. The Geology of Lake St. Clair District. Ibid., pp. 150-158.
12. 1893. R. M. Johnston. Notes on the Geology of Lake St. Clair and its immediate neighbourhood, together with observations regarding the probable origin of our numerous Tasmanian Lakes and Tarns. Ibid., pp. 135-146.
13. 1893. A. Montgomery. Report on the Country between Mole Creek and the Mt. Dundas Silver Field. Ann. Report Dept. Mines, Tas. passim.
14. 1893. T. W. E. David. Report of the Glacial Research Committee. Proc. Aust. Assoc. Adv. Science, Vol. V. p. 231.
15. 1893. A. R. Wallace. Nature Vol. 47. No. 1219, p. 437.
16. 1894. G. Officer and L. Balfour. Geological Notes on the Country between Strahan and Lake St. Clair, Tasmania. Proc. Roy. Soc. Vic. pp. 123-4.
17. 1894. T. B. Moore. Further Discoveries of Glaciation in Tasmania. Proc. Roy. Soc. Tas. pp. 56-65.
18. 1895. T. B. Moore. Notes on Further Proof of Glaciation at Low Levels. Proc. Roy. Soc. Tas. pp. 73-77.
19. 1898. J. Harcourt Smith. Report on the Mineral Fields in the Neighbourhood of Mt. Black, Ringville, Mt. Read, and Lake Dora. Ann. Rept. Dept. Mines p. xxii. passim.

20. 1900. W. H. Twelvetrees. Report on the Mineral Districts of Mts. Huxley, Jukes and Darwin. Ann. Report Dept. Mines. pp. 109-110.
21. 1901. G. A. Waller. Report on the Mineral Districts of Bell Mt., Dove River, Five-mile Rise, Mt. Pelion, and Barn Bluff. Ann. Rep. Dept. Mines.
22. 1902. W. H. Twelvetrees. Outlines of the Geology of Tasmania. Proc. Roy. Soc. Tas. p. 72.
23. 1902. W. H. Twelvetrees. Report of the Glacial Research Committee, Aust. Proc. Aust. Assoc. Adv. Science. pp. 191-2.
24. 1903. J. W. Gregory. Some Features in the Geography of Tasmania. Proc. Roy. Soc. Vict. p. 181.
25. 1904. J. W. Gregory. A Contribution to the Glacial Geology of Tasmania. Quart. Journ. Geol. Soc. pp. 37-52 (with bibliography).
26. 1904. G. A. Waller and T. W. E. David. Report of the Glacial Research Committee. Aust. Assoc. Adv. Science. pp. 613-7.
27. 1904. T. V. Legge. A Physiographical Account of the Great Lake of Tasmania. Aust. Assoc. Adv. Science. pp. 354 and 357.
28. 1905. J. W. Gregory. The Mt. Lyell Mining Field. Trans. Aust. Inst. Mining Engineers. p. 104.
29. 1907. T. W. E. David. Conditions of Climate at different Geological Periods, with special reference to Glacial Epochs. Comptes Rendus du Xme Congrès Géologique International. p. 33.
30. 1907. W. H. Twelvetrees. Geology of Tasmania. Ann. Report. Dept. Mines. p. 105.
31. 1907-8. W. H. Twelvetrees. Report upon the Geological Exploration of the country from Tyenna to the Gell River. Report of the Department of Lands and Surveys, Tasmania. p. 30.
32. 1908. W. H. Twelvetrees. Geology of Tasmania. Ann. Report Dept. Mines. p. 164 (detailed).
33. 1908. L. K. Ward. The Mount Farrell Mining Field. Geol. Survey of Tas. Bull. No. 3. pp. 5-6.

34. 1908-9. W. H. Twelvetrees. Western Exploration: Report on a Journey to the Gordon River. Report of the Department of Lands and Surveys. p. 2.
35. 1909. L. K. Ward. The Tinfields of North Dundas. Geol. Survey of Tas. Bull. No. 6. pp 8-9.
36. 1909. T. Stephens. Geological Notes on the Country traversed by the Derwent Valley Line Extension. Proc. Roy. Soc. Tas. pp. 170-4.
37. 1909. F. Noetling. Notes on the Glacial Beds of Freestone Bluff (Sandy Cove), near Wynyard. *ibid.* pp. 157-169.
38. 1909. F. Noetling. Die Glazialschichten der Wynyard in Nord-west Tasmanien. Neues Jahrbuch für Mineralogie 1909. ii. pp. 163-177.
39. 1909. F. Noetling. Entwurf einer Gliederung der jungtertiären und diluvialen Schichten Tasmaniens. Centbl. für Mineralogie. pp. 4-11.
40. 1909. H. Basedow. Beiträge zur Kenntniss der Geologie Australiens. Zeits. der deutsch. geol. Ges. p. 352.
41. 1912. W. Howchin. Australian Glaciations. Journal of Geology. pp. 193-223, especially 220-223.
42. 1913. W. H. Twelvetrees. The Middlesex and Mt. Claude Mining Field. Geol. Survey of Tasmania Bull. No. 14. pp. 9, 31.
43. 1914. L. Hills. The Jukes-Darwin Mining Field. Geol. Survey Tasmania Bull. No. 16. pp. 14-18, 57-8.
44. 1915. L. Hills. The Zinc-Lead Sulphide Deposits of the Read-Rosebery District. Part I. Geol. Survey of Tasmania Bull. No. 19. pp. 28-9.
45. 1916. L. L. Waterhouse. The South Heemskirk Tinfield. Geol. Survey of Tasmania Bull. No. 21. pp. 8-9.

ADDITIONS TO THE BRYOPHYTE FLORA.

By L. Rodway.

(Read 15th May, 1916. Issued separately 11th July, 1916.)

The mosses of Tasmania have had a very fair amount of attention paid to them, so that it is improbable any large number of new species will in future be added. The Hepatics have not been neglected, but their variability and the exceptional richness of form found in Tasmania have made their study more obscure. No doubt in the future many new species will yet be discovered, also some which we now recognise will be suppressed. Still, we can safely say that the hepatic flora of Tasmania approaches three hundred, which means it is almost the richest in species of any locality in the world.

Of the following mosses the Andreaeas would by some collectors be clubbed with *A. petrophila*, but then they would have to be treated as varieties. *A. petrophila* is most variable, and it is certainly desirable that prominence should be given to the principal forms. *Blindia acuta* was recorded as Tasmanian by J. D. Hooker. It is a European species, and as no specimen was present in any available collection it was left out of the previous work. The Tasmanian form differs from the type, its leaf margin being quite entire, and the absence of quadrate cells at the basal angles. It may yet be described as a distinct species.

Andreaea asperula, Mitt.—Stems slender often to 5 c.m., with few erect branches, forming dense red-brown mats. Leaves narrow lanceolate, very acute, slightly incurved, 1 m.m. long, insertion narrow, not at all stem-clasping nor geniculate, surface asperate, papillæ often very large, margin incurved.

A member of the petrophila group, it differs from *A. petrophila* and *A. tenera* in the asperate cuticle and the narrower leaf bases.

Western Tiers, Eastern Australia.

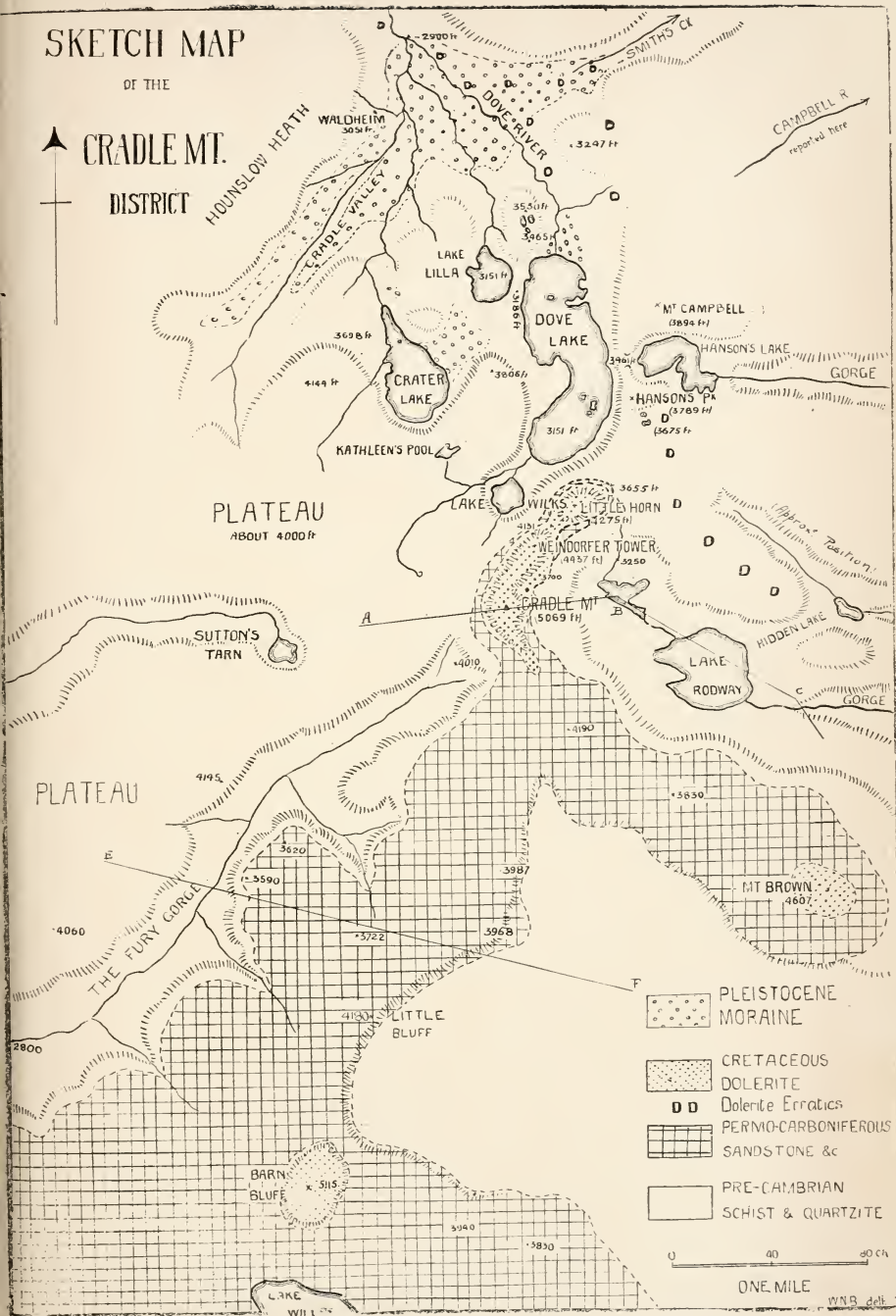
Andreaea tasmanica, n.s.—Stems slender, about 1 c.m., crowded in dense mats, dark brown, upper leaves linear from a slightly broadened base, strongly falcate and secund, 0.8 m.m. long, margin involute, apex acute, surface nearly smooth, nerveless. Lower leaves and those of young shoots minute, closely appressed, very broadly oblong, with

SKETCH MAP

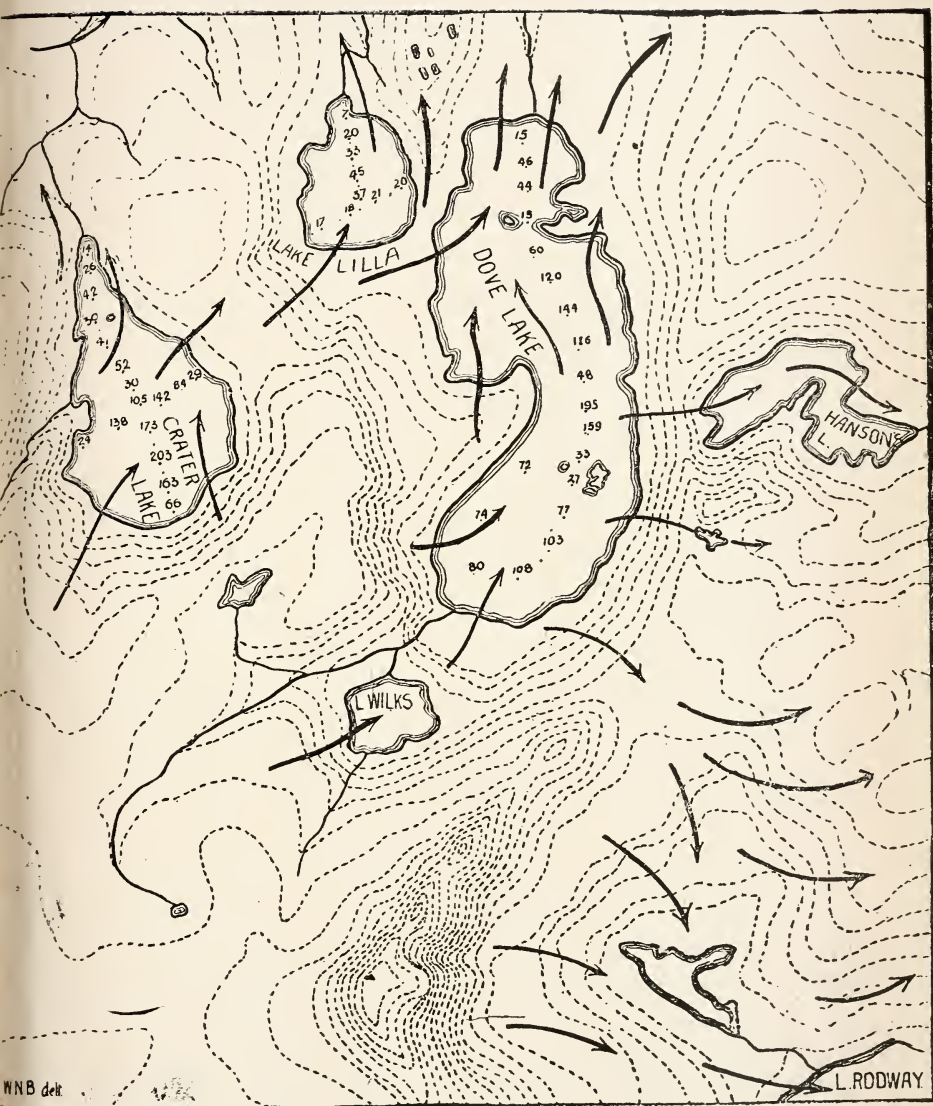
OF THE

CRADLE MT.

DISTRICT



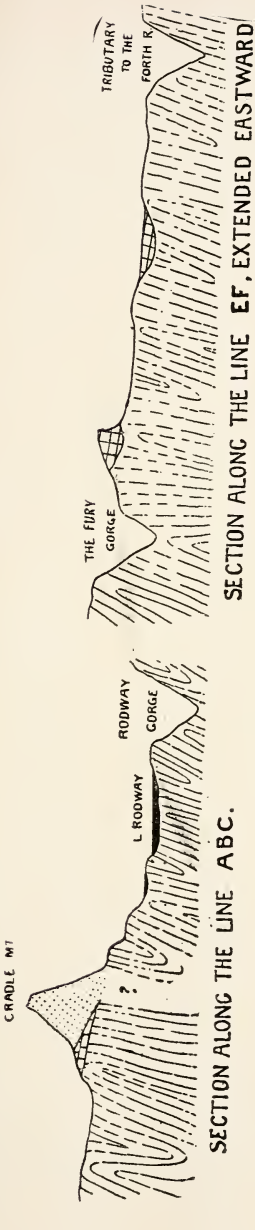
GEOLOGICAL SKETCH MAP OF CRADLE MT. DISTRICT.



TOPOGRAPHIC SKETCH MAP OF CRADLE MT. AND LAKES.

The arrows indicate direction of Ice movement during Glacial Period. Scale, 1 inch = 640 yards.

Contour Interval about 100 feet. Soundings in feet. (Figures approximate only.)



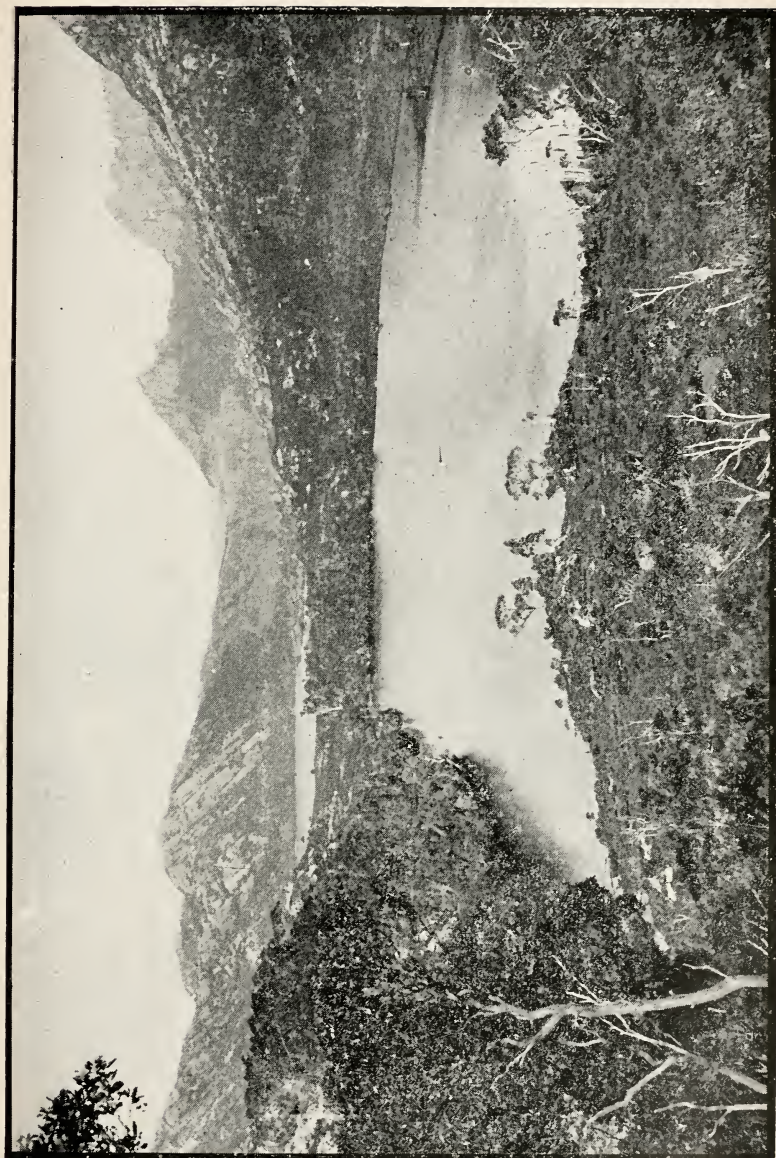
GEOLOGICAL SECTIONS ACROSS THE CRADLE MT. DISTRICT (See Plate I.)
VIEW OF CRADLE MT. FROM THE EAST, BARN BLUFF IN THE BACKGROUND (ON LEFT).

Mt. Campbell.

Hanson's Peak.

Mt. Brown.

Little Horn.



LAKE LILLA (Foreground) AND DOVE LAKE, NORTH END OF CRADLE MT. ON RIGHT,
MT. BROWN IN BACKGROUND (Centre).
PHOTO. BY SPURLING, LAUNCESTON.

a short acute reflexed apex margin with prominent papillæ. Sterile. The leaves are narrower and less sheathing than in *A. petrophila*, and the peculiar juvenile foliage is very distinct.

Cradle Mountain.

Blindia acuta, Br. et Sch.—Suberect, slender, 2-4 c.m., black except the young tips. Leaves crowded erect or little falcate, base rather broad, sheathing occupying less than a third of leaf, rest filiform, wholly composed of nerve; margin entire; nerve broad, flat; length about 4 m.m.; cells linear with no quadrate alars or any auricular expansion. Seta about 1 c.m. thick; capsule hemispheric 1 m.m. broad and long; peristome teeth nearly as long as the capsule, irregularly cleft half-way, or deeper.

Readily distinguished by the hemispheric peristomate capsule, or when sterile from the gymnostomous species by the less falcate leaves and from *B. arcuata*, Mitt., by the absence of quadrate cells at the basal angle.

In "Braithwaite's Moss Flora," the angular cells are given as "large, orange-brown." This does not appear so in Tasmanian specimens referred to this species.

Western Tiers, Cradle Mt.

This moss has been previously recorded for Tasmania, but was not included in this work, because no specimen was present on any available collection.

The following hepatics are new to science. It was with reluctance that they were so recorded, but no place could be found for them amongst forms already described.

Aplozia lacerata, n.s.—Stems short in cushions, but often hidden amongst moss, or partially buried in debris, and bearing only a few leaves in the upper portion, tender and pale sage green. Leaves almost transverse oblong to nearly rotund, concave, 0.7 m.m., cells 27 μ , walls thin. Bracts much longer than the leaves, narrow oblong apex slightly fimbriate, bracteole nearly as long as the bracts, ovate obtuse, all adnate to the base of the perianth. Perianth cylindric, with three shallow plaits, little longer than the bracts, mouth narrow to little constricted, deeply 3-lobed, lobes narrow lacinate.

Mt. Wellington Plateau.

Alicularia tenella, n.s.—Decumbent or ascending, dispersed amongst other small plants, rarely forming mats. Leaves ascending, flat or slightly concave, oblong to rotund, rather delicate and flaccid, 1 m.m. base subdecurrent; cells 32 μ . Trigones small or none, cuticle smooth. Marsupium short and broad, bracts very large.

Mt. Hartz, Adamson Peak, St. Patrick's Head, Cradle Mt., etc.

Sphenolobus nigrus, n.s.—Small densely clustered in blackish cushions, the shoots simple or with few branches about 1 c.m. long. Leaves obcuneate from a narrow base, spreading, bifid to the middle, lobes broad, apex rather acute, 1 m.m. long; cells 14 μ ., with very thick walls, cuticle smooth. Bracts similar to the leaves, only larger, connate with an oblong bracteole. Perianth broadly cylindrical, deeply 5-grooved, 2 m.m. long, mouth closely contracted, with a few short fimbriæ.

On rocks in rivulet, Cradle Mt.

Anastrophyllum tasmanicum, n.s.—Robust pale olive green, branching 3-4 c.m. Leaves not strongly secund, almost squarrose, nearly symmetric, to $\frac{1}{3}$ bilobed, lobes nearly equal, broad usually with a very acute apex margin just above the ventral base, armed with a few acute teeth, 1.4 m.m. long; cells 20 μ ., cuticle coarsely verrucose. Perianth narrow, ovate, 3 m.m., with about 8 deep plaits.

Very like *Chandonanthus squarrosus*, but the complete absence of under leaves and paraphylls distinguishes it.

Adamson Peak, Mt. Hartz.

Lophocolea paucistipula, n.s.—Robust. Simple or with few vague branches 2-4 c.m. Leaves crowded, imbricate rotund, 1.3 m.m., margin entire, dorsal base subdecurent, ventral ampliate; marginal cells 20 μ ., trigones small, intermediate cells 35 μ ., basals 60 x 25 μ ., trigones none; under-leaves absent, except in the reproduction region, sometimes only a narrow dentate bracteole present; at others 2-3 large oblong under-leaves, with recurved margins, very like those of *L. austrigena*, and below these 2-3 reduced to vanishing spines. Bracts oblong, twice as long as the leaves, often with a filiform process near the ventral base, bracteole narrow oblong, shortly bidentate, margin often dentate; perianth narrow campanulate $\frac{1}{2}$ exserted, trigonous, median keel dorsal, mouth broad, with 3 broad unarmed lobes.

Bank of creek near Cradle Mt.

Lembidium anomalum, n.s.—Stems pinnately branched, ascending from a creeping stoloniferous base, dark livid green. Leaves imbricate to distant incubous to sub-transverse rotund, very concave, erect, 0.9 m.m., apex and margin entire; cells unequal, mostly 18 μ ., sometimes a band of larger colourless cells on the margin, walls rather thick, trigones small, cuticle smooth; under-leaves similar in size and shape to the leaves. Bracts oblong, not much

enlarged; perianth terminal on short lateral branch, narrow cylindric, 8 m.m. long, mouth tapering fimbriate; capsule oblong.

The species is an aberrant member of the genus, but appears to have no nearer relationship elsewhere.

Cradle Mt.

Isotachis riparia, n.s.—Robust, almost black, stems 5-8 c.m. Leaves erect, closely imbricate, broadly ovate to almost rotund, 3 m.m. long, apex shortly bifid, lobes short, broad, subacute margin entire or with one or two very short teeth; upper cells $27\ \mu$., walls thick, lower cells $40 \times 18\ \mu$., walls thinner, cuticle smooth; under-leaves to 3 m.m. long, 2 m.m. broad, oblong apex shortly bifid, margin entire or armed with 3 small teeth.

Near *I. gigantea*, St., only leaves much smaller.

Cradle Mt.

Isotachis attenuatus, n.s.—Stems long and very slender, growing amongst moss in wet situations. Leaves rather remote, erecto-patent narrow oblong from a narrow base, dark brown $\frac{1}{2}$ bifid, 0.5 m.m.; outer cells $18\ \mu$., inner $18 \times 24\ \mu$., walls thick; under-leaves similar. Bracts, many similar to the leaves, but larger; perianth terminal, 1 m.m. long, ovate strongly triquetrous, keels obtuse, mouth obtuse, shortly fimbriate.

Mt. Wellington Plateau.

Schistochila parvistipula, n.s.—Stems mostly about 3 c.m., decumbent copiously radiculose, thick, fleshy. Leaves squarrose, loosely imbricate, broadly ovate, obtuse, 4 m.m. long, lobes nearly equal, and united to the apex, dorsal lobe attached by the margin, wing simple, relatively broad, margins entire, but often an obscure tooth near the apex of the dorsal lobe; cells rotund, 35-50 μ ., walls rather thin, trigones small, concave; under-leaves oblong, rather narrower than the stem, 1.3 m.m. long, bifid below the middle, lobes lanceolate, acute margin, with few ill-defined teeth.

Cradle Mt.

DISCOVERY OF AN ABORIGINAL CHIPPED FLAKE IN DEEP GROUND NEAR GLADSTONE.

By W. H. Twelvetrees.

Plate V.

(Read 10th July, 1916. Issued separately 8th August, 1916.)

Up to the present, aboriginal worked flakes have been recorded only from the surface of the ground, or in shifting superficial sands such as the sand dunes of the coasts. It has been recognised by every investigator who has dealt with the question that the Tasmanian aboriginal migrated to this island on dry land, and therefore prior to its separation from Australia; the absence of the dingo also has been appealed to as proof that at the time of the migration the animal had not then entered Victoria.

At the time of the separation the sea invaded the north-eastern part of the island for many miles inland from the present coast-line. The marine waters laved the northern base of Mt. Cameron, and worked their way round the eastern end of the mount, covering the ground between the present Ringarooma and Mussel Roe rivers. Residual hills and other deposits of marine grits attest the former presence of the sea in this area.

Subsequently the land rose and brought the old marine drifts above sea level. The aboriginals, therefore, must have witnessed both the invasion by the sea and its retreat. It would consequently seem natural for the pre-invasion deposits, such as the beds of fresh-water streams, lagoons, and sea beaches, to contain aboriginal implements. Beds of this nature could probably not be expected to contain them in quantity; nevertheless, the discovery in them of stray examples may be anticipated. Possibly some have already been found, but have not been recognised by the discoverers.

I happened to be at Gladstone last March when a worked stone of chalcedony was brought to me as a strange specimen found by Mr. Richards in working Richards's and Murray's alluvial tin claim at the old Doone mine, north of the Ringarooma River, and two miles from Glad-

ABORIGINAL IMPLEMENT FROM GLADSTONE.

OBVERSE.



REVERSE.



The figures are slightly enlarged, the natural size of the implement being $1\frac{1}{2}$ inch in its maximum diameter. They show both sides, the obverse being the chipped side and the reverse the smooth side. The serrated upper edge is well seen in the reverse figure.

stone. I recognised it as an aboriginal flake, but, to make sure, I submitted it to Mr. R. M. Johnston, whose knowledge of these implements is unrivalled, and he at once pronounced it to be of human workmanship.

The following day I proceeded to the claim in order to examine the conditions of occurrence. The actual block of gravel from which the stone had been picked had disappeared in sluicing, but I stood on the actual site of the discovery, and Mr. Richards, who enjoys a high reputation for reliability and integrity, explained to me all the attendant circumstances.

The mine owners are sluicing tin ore from a bed of gravel $2\frac{1}{2}$ to 4 feet thick, which underlies 10 to 20 feet of a drift which has been deposited all over this plain by the sea in former times. This overburden of drift has to be removed before the wash gravel is exposed. In the course of working, an excavation has been made below the surface of the ground about half a chain wide and 10 feet long with a maximum depth of 25 feet.

After bringing down the overburden at the west end of the excavation by means of a stream of water, a block of wash or gravel, here $2\frac{1}{2}$ feet thick, was detached from the cliff face at a depth of 10 feet from the surface, and from the top of this block Mr. Richards picked out the flake in question, noticing that it was a different kind of stone from any he had previously seen in the wash. It was slightly adherent to the gravel, and broke in two pieces as he handled it. Not attaching any particular importance to it, he did not preserve the piece which was broken off. On examining the plane of fracture, a deposit of silica is noticeable on the surface of it. I examined the working face closely, with a view of seeing whether it was at all possible for the stone to have been derived from the surface, but the possibility seemed to be quite excluded. The two facts that it was adherent to the wash, and that silica had crystallised on the fracture plane, add additional weight to the conclusion that the stone belonged to the wash.

We are shut up to the conclusion that it is the handiwork of aboriginals who lived at the time of the deposition of the wash (probably a beach deposit) and prior to the accumulation of the overlying marine sands. It is not waterworn. Most of the stones in the wash are well worn by the action of water, but there are some among them which are absolutely angular, though they have to be looked for.

The question arises what amount of denudation have the overlying drifts undergone since deposition? Is there

any way of making even a roughly approximate estimate of this! Two and a half miles to the north-west, near the MacGregor and Aberfoyle claims, two hills of made ground, Brown's Hill (sometimes called the Aberfoyle Hill) and the Little Hill, rise from the plain to a height of about 60 feet. These are residual hills of cemented marine drift which once covered the area of this great plain. A mile and a quarter to the north-west of the Doone the Government line of bores shows bedrock at upwards of 100 feet below the surface of the drift, but in that direction there does not appear to be any available indication to serve as guide in an estimate of denudation. To keep strictly within the limits of the evidence, we must confine our estimate of minimum denudation to about 70 feet, which is the difference of level between the Doone wash and the summit of the Aberfoyle Hill.

The Doone is about 7 miles from the coast line at Boobyalla; its height above sea level has not been determined, but probably does not exceed 60 or 70 feet, and is perhaps less than that, as I am informed that the tide backs up the fresh water in the Ringarooma west of the Aberfoyle Hill.

Further confirmation of the antiquity of the wash is derived from the fact that the general body of drift extends southwards across the Ringarooma River, which has subsequently intersected it. Thus the wash and the overlying drift existed before the Ringarooma flowed in its present channel. But can the age be thrust as far back as the time when the ancient Ringarooma flowed cut to sea at the west end of Mt. Cameron? Such a conclusion would involve an age too great to accord with accepted views of the antiquity of man in Tasmania, but the deposition of these sediments was plainly prior to the final establishment of the existing channel in this part of the course of the river.

TASMANIAN BRYOPHYTA.

By L. Rodway.

(Read 10th July, 1916. Issued separately 30th Aug., 1916.)

HEPATICS.

The second class into which the Bryophyta are divided is a purely natural one. There are no intermediate forms through which the two groups are connected, though their close relationship is very apparent. There is always a natural distinction, requiring no arbitrary line to separate them.

The gametophyte is varied in structure; many have the form of a flat, green plate, while the greater number develop leaves; yet when leaves are present these have a distinction of insertion and structure quite different from those of Mosses. Leaves are always placed in two or three rows, two lateral and one ventral, the latter row occasionally being absent. They are usually of delicate consistence, never have a midrib, and are often divided. Most Hepatics live only under permanently moist conditions, but some few can survive even the drying conditions of bare rock at a high elevation.

The characteristic feature of Hepatics is that while they have the typical antheridia, archegonia and permanently attached sporophyte of the class, the sporophyte has attained a much further reduction than amongst Mosses. It is no longer a hard-tissued, persistent being, but is reduced to a comparatively evanescent organ. In most it is a simple globular or oblong dark capsule, which splits into four valves at maturity, borne on a long or short pellucid stalk. In *Marchantia* and its allies the stalk is almost absent. In *Riccia* reduction has reached its limit, and the sporophyte is reduced to a spherical spore sack, buried in the substance of its parent. One order of Hepatics, of which *Anthoceros* is the type, has a sporophyte of less reduced character than the rest, but still of a form not to be confused with that of a true moss; the shape is long and slender, and it splits from top to base into two valves. It is green, and still bears efficient stomata on its surface. Hepatics may be sorted into three perfectly natural Orders:—

MARCHANTIALES,
JUNGERMANNIALES,
ANTHOCEROTALES.

MARCHANTIALES.—The gametophyte is always a procumbent green thallus. This has in many genera attained a complex structure. In most species an efficient system of air-chambers is formed, communicating with the atmosphere through more or less developed pores. The under surface bears scales and copious rhizoids. The organs of reproduction may occur simply on the surface of the frond or may be borne on specially constructed, erect branches. In *Riccia*, at the one extreme the archegonia are buried in the upper tissue, with their necks just exposed; in *Marchantia* they grow on a special convex cushion. After fecundation in *Riccia* the archegonium, with its enclosed sporophyte, sinks into the substance of the frond, and assumes the form of a simple spore case. In *Marchantia* the branch grows erect, the top expanding into an umbrella-like body displacing the fertilised archegonia to the under surface. The sporophytes develop under the protection of this cap, and do not require and do not develop a long stalk. In all except *Riccia* spiral hygroscopic elaters are mixed with the spores.

JUNGERMANNIALES.—To this order belong the greater number of Hepatics. The structure of the gametophyte is very varied. In some forms it is a flat green frond of simple outline, bearing the reproductive organs upon the dorsal or ventral surface or upon short special branches. Others develop marginal expansions, which are considered primitive leaves or lobes of the frond, according to the view taken by the observer, while the greater number of species have true leaves. When this is so these organs are inserted in three rows, two being lateral and one ventral. The ventral leaves are generally smaller than the others, and are in some species absent. They are generally referred to as underleaves, amphigastria, or stipules. In the region of the archegonia the leaves in most species are much enlarged; the last ones are often united in a sheath, called the perianth, round the fructification. Sometimes instead of the upper leaves uniting to form the perianth a special development grows up from the stem to form a perianth-like sheath, and is known as a pseudoperianth. The enlarged leaves outside the perianth are called the involucre, or in leafless forms, involucreal scales may be formed at the base of the perianth. The lateral leaves of the involucre are often named bracts, and the corresponding underleaf the bracteole. After fertilisation the archegonium enlarges round the sporophyte, and forms the calyptra. Some species do not develop a perianth. When this is so the calyptra generally becomes thick and fleshy.

In this latter case the calyptra, instead of being formed entirely by the enlarged archegonium, may be a growth of a sack-like character from the stem. When this is so the barren archegonia are carried up on its apex. The sporophyte consists of a typical capsule of dark colour, which splits on maturity into four valves. It is borne on a long or short pellucid stalk; the base consists of a foot, which bores into the stem of the parent plant. In some instances the parent forms a descending fleshy sack, the marsupium, into the base of which the sporophyte is attached. The spores are intermixed with very hygroscopic, spiral elators. Jungermanniales is divided into two sub-orders, or families, the *Metzgeriaceae* or *Anacrogynae*, in which the sporophyte develops otherwise than at the apex of a shoot, and the gametophyte is seldom leafy, and the *Jungermanniaceae* or *Acrogynae*, where the sporophyte terminates, a shoot or branch, and the gametophyte is usually leafy.

ANTHOCEROTALES.—This is an Order of plants that departs in structure very materially from what may be considered the typical hepatic form, yet sufficiently close to warrant it being included in the Class. The gametophyte is a more or less flat, green thallus of simple structure. It has more the simple tissue of the *Anacrogynae* than of the *Marchantiaceae*, but differs in its cell construction. Instead of numerous discoid chloroplasts, otherwise universal among Bryophytes, there is but one large flat or ringed chromatophore in each, cells recalling the condition present in many Algae. The reproductive organs are of the Bryophyte type, but sunk in the tissue on the dorsal surface. The sporophyte is peculiar. There is a well-developed foot and a short sterile portion, representing a stalk. The spore-bearing portion is very long, green, filiform, and continues to grow at the base long after the apex is mature. The spore producing tissue is a cylinder between the epidermis and a central sterile column. The epidermis usually possesses true stomata, and intermixed with the spores are degenerate elators, usually small and functionless. The sporophyte at maturity splits at the apex into two valves, away from the erect columella. These valves slowly curl away from the axis as the tissues below mature.

MARCHANTIALES.

This Order includes two families:—

RICCIACEAE.—The sporophyte has reached the limit of reduction, and appears as a spore-bearing sphere sunk in the tissue of the frond.

MARCHANTIACEAE.—The sporophytes are free and borne upon specially constructed branches. In the most advanced type these are erect, umbrella-shaped, and carry the sporophytes on the under surface of the head.

RICCIACEAE.

The fronds usually form small dichotomously divided rosettes on damp earth, or more or less cordate bodies floating on water. The substance is thick in the middle, tapering to the margins with a median groove on the upper surface. The ventral surface bears one row of scales and numerous rhizoids. The upper surface is formed of closely packed columnar cells. There are usually no pores, but air cells are formed below the surface, which may remain small or may enlarge, become confluent, and eventually burst through the dorsal surface. The antheridia and archegonia are immersed. The sporophyte matures within the enlarged archegonium still sunk in the tissue of the frond. All the contained tissue of the sporophyte develops into spores; no elaters are formed. The spore tetrads remain attached till mature; the exposed surface is variously sculptured; the rest is smooth. There are two genera:

RICCIA.—Epidermis without pores; antheridia scattered.

RICCIOCARPUS.—Epidermis with distinct pores; antheridia confined to the median furrow.

RICCIA-MICH.

The character of the family.

In section as deep as broad *tasmanica*

In section much broader than deep.

Air spaces very narrow *crassa*

Air spaces broad *weymouthiana*

Riccia tasmanica, St.—Fronds about 1 cm. long, 2 mm. wide, simple or forked, apex retuse to nearly acute, upper surface concave, with slightly broad median furrow; surface crystalline, pale green, margin pellucid, rather acute, entire or nearly so; chlorophyllous stratum dense, the cells about 30 μ . diameter, their exposed ends mamillate, but soon lost. Spores dark brown, 80 μ . diameter; margin narrow, the convex face with about 9 areolae, flat faces with shallower areolae. Ventral surface very convex; in section as deep as broad.

Mt. Nelson, Domain, Hobart. Probably common

on grassy hills, but easily overlooked. Apparent only in winter and spring.

Riccia crassa, St.—Fronds 1-2 cm. long, 3 mm. wide, simple or forked, apex obcordate, upper surface concave, with a shallow acute median groove, wings becoming convex with age; margin acute undulate, often tinged with purple; chlorophyllous stratum rather dense, with narrow air spaces, cells about 40 μ diameter. Spores light brown, 70 μ . diameter, convex surface with shallow reticulations, about 10 areolae, flat faces nodulose. Ventral surface convex. Three times as broad as deep.

Lindisfarne, Central Australia.

Riccia weymouthiana, St.—In general appearance and structure not differing from the last, only spores rather larger, 80-90 μ ., and the air spaces large and bursting through the upper surface. Doubtfully distinct.

Lindisfarne, Mt. Abrupt.

RICCIOCARPUS CORDA.

Obcordate seldom forming rosettes, upper surface with a median furrow, and furnished with pores; chlorophyll-layer not well defined, nearly the entire thickness occupied by air chambers; ventral surface, with numerous long, dentate, violet-coloured scales. Antheridia collected in the median furrow.

Ricciocarpus natans (L.), Corda.—Obcordate about 1 cm. long, flat, scales about 5 mm. long.

Floating on a lagoon, George Town; Cosmopolitan.

MARCHANTIACEAE.

Fronds flat, procumbent, dichotomously dividing, dorsal surface with well developed pores, opening into simple or compound air spaces; ventral surface with two or more lines of scales; reproductive organs grouped, usually on special branches. The branches bearing fertilised ova assuming a specialised character, usually in the form of an erect umbrella-shaped body (carpocephalum). Well developed elators always present.

Pores simple.

TARGIONIA.—Sporophyte enclosed in a pair of large bracts, partly concealed beneath the edge of the frond.

REBOULIA.—Sporophytes on a persistent carpocephalum. Not bearing gemmae.

LUNULARIA.—Sporophytes on a perishing carpocephalum. Gemmae always present in a crescent-shaped receptacle.

FIMBRIARIA.—Sporophytes on a persistent carpocephalum; each contained in a white, conspicuous fimbriated perianth.

Pores formed of a barrel-shaped arrangement of cells.

MARCHANTIA.—Sporophytes on a persistent carpocephalum, alternating with the rays. Gemmae in fringed cups.

TARGIONIA, L.

Thallus tough, with small air chambers on the upper surface; pores simple, surrounded by several concentric rings of cells; ventral surface with two rows of large obliquely triangular scales, each with a broadly awl-shaped appendage. Antheridia on special branches arising from the under surface, cylindric, with an expanded terminal receptacle just emerging from the side of the frond. Archegonia in two rows on the ventral surface, just behind the growing point, enclosed in two large bracts. Sporophyte spherical, with a short stalk, enclosed in the enlarged purple bracts, slightly protruding at maturity.

Targionia hypophylla, L.—Fronds cuneate, 1-2 cm. long, apex bifid, sometimes dichotomous, but more often the branches arise from the ventral surface, which is purple to black. Mature involucre nearly black, about 4 mm. diameter, just protruding from beneath the apex.

McRobie's Gully, Colebrook, Launceston, etc. Mature about October.

Cosmopolitan.

REBOULIA RADDI.

Thallus dichotomously branched, flat; air chambers small on the dorsal surface, with simple pores, surrounded by several rings of concentric cells, ventral surface purple, with two rows of large oblique obovate scales, each with two linear appendages. Antheridia on a flat sessile receptacle placed on the dorsal surface close behind the apex. Carpocephalum persistent, hemispheric, with a more or less lobed margin, on a long stalk. Capsule globose on a short stalk, no perianth, contained each within an involucre placed on the ventral aspect of a lobe. The pores of the carpocephalum are barrel-shaped in longitudinal section; the stalk has a single furrow, with numerous rhizoids. No gemmae cups.

Reboulia hemispherica (L.), Raddi.—Fronds robust, fleshy. Much resembling a Marchantia, but readily distinguished by the absence of areolae, the pores in section being simple, not barrel-shaped, and the capsules being

borne on the lobes of the carpocephalum, and not alternating with them.

Very widely distributed, but not common. Cosmopolitan.

LUNULARIA ADANS.

Robust, flat, fleshy, bright green, dorsal surface areolate, each with a simple pore, surrounded by concentric rings of cells. Ventral surface green, with two rows of very tender, colourless, broadly lunate scales, each with a rotund appendage. Antheridia on flat, sessile, dorsal plates. Carpocephalum colourless, or pale green, tender, and soon wilting. Stalk without a groove, hairy, mostly 2-4 cm. long; head of four cruciate, horizontal, tubular involucre, each about 2 mm. long; perianth absent. Gemmae always present in lunate cups.

Lunularia cruciata (L.), Dum.—Very common in greenhouses and gardens. Introduced.

FIMBRIARIA, NEES.

Fronds tough, flat or concave, linear rarely forked, with a thick midrib. Dorsal surface areolate, with small air chambers; pores conspicuous, simple, surrounded with concentric rings of cells. Ventral surface convex, with two rows of large purple scales, each with an appendage. Antheridia immersed in the frond. Carpocephalum persistent, purple, conic or hemispheric, on a long, slender stalk, four lobed, each containing a single capsule; involucre slender; perianth ovate, white, split into many linear sections. Capsule globose, with a very short stalk. The small size and conspicuous white fimbriated perianth makes the genus easily recognised.

Carpocephalum hemispheric, coarsely
warted. Spores 150 μ . dia-
meter *drummondii*
Carpocephalum hemispheric, nearly
smooth. Spores 60 μ . diameter *tenera*
Carpocephalum conic *conocephala*

Fimbriaria drummondii, Tayl.—Fronds flat, about 1 cm. long, 3-4 mm. wide, dull green, purple beneath and on the margin, midrib thick, but not much produced on the ventral surface, wings broad, thin, margin acute, irregularly crenate, new shoots ventral from the midrib, pores large and prominent, ventral scales obliquely ovate, purple; appendage colourless, not constricted at the base, ligulate, with a shortly acuminate apex. Peduncle to 2 cm.; carpocephala hemispheric, coarsely warted, lobes

well developed; perianth partially exserted. Spores about 150 μ . diameter, yellowish-brown, broadly winged.

Near Launceston, New Zealand, Australia.

Fimbriaria tenera, Mitt.—Fronds about 1 cm. long, 4 mm. wide, flat, green, with little or no purple beneath, midrib broad, ventrally convex; wings thin, with an obtuse margin, new shoots apical, rarely ventral; pores large, but not very prominent; ventral scales obliquely ovate, colourless, appendage narrow, shortly acuminate, sometimes tinged with purple. Peduncle 1.5 cm.; carpocephala hemispheric, nearly smooth; lobes well developed; perianth short. Spores 60 μ . diameter, brown, reticulately winged.

New Zealand.

Fimbriaria conocephala, St.—Fronde 1-2 cm. long, 3mm. wide, concave, and often dark purple throughout, sometimes green on the dorsal surface; midrib strongly convex on ventral aspect; wings as broad as the rib, strong, with an acute crenate margin; new shoots ventral or apical; pores large, prominent; ventral scales ovate, with a short, ligulate appendage. Peduncle 0.5-2 cm.; carpocephala conic, obtusely warted; lobes larger than the umbo; perianth very exserted; spores 100 μ ., with a very broad reticulate wing, yellow, wing entire.

F. tasmanica, St., differs in the appendage, being long, with a slender bifid apex, but the character appears inconstant.

Knocklofty, Hobart; very common; Eastern Australia.

MARCHANTIA, L.

Large, fleshy, repeatedly forked, closely decumbent. Dorsal surface marked into lozenge-shaped areolae, each with a central pore opening into an air chamber; pores in perpendicular section barrel-shaped, formed of about four series of cells; external orifice surrounded by 4-6 concentric rings of narrow cells; internal orifice cruciate, or nearly quadrate in Tasmanian species. Carpocephalum with a long stalk, with two rhizoid-bearing grooves; head convex; margin lobed or entire, involucre alternating with the lobes, 2-valved fimbriate enclosing several sporophytes; perianth present, plain, capsule stalked. Antheridia on a pedunculate discoid, erect branch. Gemmae large, in cups, with a fimbriate margin.

Margin of carpocephalum deeply lobed 2

- Margin of carpocephalum entire or with shallow lobes 3
2. Lobes terete. Scales broad, pale *cephaloscypha*
- Lobes flat. Scales narrow, purple *foliacea*
3. Carpocephalum margin shortly lobed... *pileata*
- Carpocephalum margin entire *fusca*

Marchantia cephaloscypha, St.—Midrib not defined. Scales pale, short, but very broad, extending nearly to the margin. Peduncle 5-10 cm., head nearly 1 cm.; lobes long, terete, 9, often recurring at maturity. Very close to *M. tabularis*, Nees.

Abundant, especially after fire. Australia, New Zealand, South America.

Marchantia foliacea, Mitt.—Midrib broad and usually well defined. Scales dark purple, as long as broad, not extending over the wings. Peduncle 5-10 cm., head nearly 1 cm. diameter, divided half-way into 9 broad flat lobes, one division much deeper than the others.

Common on banks of streams; New Zealand.

Marchantia pileata, Mitt.—Midrib narrow, ill-defined, under surface red. Scales obliquely ovate, not extending on the wings, dark purple. Peduncle about 1.5 cm.; head hemispheric, 4-5 mm. diameter, asymmetric, 5-6 short, broad lobes, insertion of peduncle almost lateral.

Mt. Wellington, Bruny Island, Meander River, New Zealand.

Marchantia fusca, St.—Midrib thick, insensibly attenuating into the wings. Peduncle about 7 mm. long; head hemispheric, 4-5 mm. diameter, symmetric, margin quite entire. Other details as in *M. pileata*.

Slopes of Mt. Wellington. Rare. New Zealand.

JUNGERMANNIALES.

This Order contains two families:—

METZGERIACEAE.

JUNGERMANNIACEAE.

The marked feature of the first is that the archegonia are developed upon special branches, which are never at the apex of a shoot. These branches are sometimes so much reduced that the organs appear to grow on the surface or side of a frond. The members of this family are mostly thalloid, but a few genera are leafy. In the second

family the sporophyte terminates the main axis, or a lateral branch, though in some genera this is obscure. In all cases the plant is leafy, only in one genus, *Zoopsis*, reduction has obscured this. The two families are quite distinct, though the dividing line is not easily defined.

METZGERIACEAE.

Generally thalloid, rarely leafy. Tissue of the frond never with air-chambers or ventral scales; a midrib is generally well defined. Sporophyte solitary, on the side or surface of the frond, never borne on a special apparatus, having an involucre and often also a pseudo-perianth.

Plant thalloid, expanded.

ANEURA.—Fleshy, thick, at least in the middle; no defined midrib. No perianth. Calyptra large, fleshy, papillate.

METZGERIA.—Membranous, wings thin, midrib very narrow, well marked. Frond forked, equal breadth throughout. No perianth. Calyptra hairy.

HYMENOPHYTUM.—Cylindric below, winged above. Fruit from the under surface. Perianth present.

PALLAVICINIUS.—Cylindric below, winged above. Fruit on the upper surface. Perianth present.

SYMPHYOGYNA.—Cylindric below, winged above. Fruit from the upper surface. Perianth absent.
Plant leafy.

TREUBIA.—Leaves reduced to lateral lobes. Seta very long.

FOSSOMBRONIA.—Leaves erect closely overlapping. Seta short.

ANEURA, DUM.

Leafless, decumbent, but often with ascending branches, vaguely branched, thick or membranous; no distinct midrib, but thick in the middle and thinner towards the margins; surface, or cortical layer of cells, usually much smaller than the inner cells, and chlorophyllous. Reproductive organs on short lateral branches on the lower part of the frond. Perianth absent. Calyptra large, clavate, fleshy. Capsule on a long seta, 4-valved, elators attached to the apex of the valves. Gemmae formed in the cortical cells, oblong, 2-celled.

The plants are very variable in general form, and it is necessary to study their structure. A transverse section is always desirable.

- | | |
|--|----|
| Branches, broad | 2 |
| At least ultimate branches less than 1 mm.
wide | 11 |
| 2. Marginal cells larger than those of the
cortex, generally colourless | 3 |
| Marginal cells not distinct | 7 |
| 3. Concave, thick, surface waxy... .. <i>pinguis</i>
Flat, marginal cells striate <i>stolonifera</i>
Condition otherwise | 4 |
| 4. Branches pinnate | 5 |
| Branches erect, simple | 6 |
| 5. Margin entire <i>alterniloba</i>
Margin dentate <i>dentata</i> | |
| 6. Margin of rectangular colourless
cells, but often indistinct <i>erecta</i>
Margin with a conspicuous border of
large quadrate cells <i>cochleata</i> | |
| 7. Surface conic-papillate <i>tasmanica</i>
Surface armed with small rough
papillae <i>colensoi</i>
Surface smooth | 8 |
| 8. Margin acute | 9 |
| Margin obtuse | 10 |
| 9. Robust, about 12 cells thick <i>longiflora</i>
Broad, thin, about 5 cells thick... .. <i>polymorpha</i> | |
| 10. Concave to slightly convex <i>pinnatifida</i>
Strongly biconvex <i>crassa</i> | |
| 11. Main trunk and branches flat, pinnules
linear biconvex <i>palmata</i>
All parts linear | 12 |
| 12. Strongly biconvex, margin obtuse <i>alcicorne</i>
Margin acute | 13 |
| 13. Margin not bordered | 14 |
| Margin bordered | 15 |
| 14. Both surfaces slightly convex <i>gracilis</i>
Ventral surface flat <i>perpusilla</i> | |
| 15. Small, stem and branches similar <i>minima</i>
Robust, decumbent, hirsute, branches
erect, bi-tripinnate <i>ericaula</i> | |

Aneura pinguis (L.), Dum.—Decumbent, very concave, thick and of a greasy or waxy appearance, margins wavy, acute edged, with 1-2 series of larger colourless or purple cells, relatively thick in the middle, and very convex on the ventral side, branches few and irregular, often 2-3 cm. long, 5 mm. wide to much smaller. Calyptra often 7 mm. long, thick and coarsely papillate. Very variable in size, but the character always distinct.

Mt. Wellington, New Zealand. Cosmopolitan.

Aneura alterniloba, Hf. et T.—Robust, often 3-5 cm. long, and 5-10 mm. wide, procumbent, broad and tough, with short, broad, lateral branches or lobes, flat or slightly convex, 8-10 cells thick in the middle, margins acute of one series of large cells.

Common in wet gullies. New Zealand.

f. robusta.—Fronds 6-10 cm. long, 1 cm. wide, with few or no lateral branches, margins alternately lobed, lobes obtuse or retuse, 2 mm. long, 4 mm. broad at the base.

Russell Falls.

Aneura crassa, Nees.—Robust, rigid, tough, 3-6 cm. long, 2-3 mm. wide, bipinnate, branches very irregular, sometimes all short, biconvex, 12 cells thick in the middle, margin very obtuse, apex immarginate.

Mt. Wellington. New Zealand.

Distinguished from *A. pinnatifida* and *A. longiflora* by the obtuse margin, and from *A. alterniloba* by the absence of the enlarged marginal cells.

Aneura pinnatifida, Nees.—Dark green to black, densely pulvinate, generally 1-2 cm. long, 1.5 mm. wide, with few or many lateral branches, typically very concave dorsally, but varying to flat or slightly convex, 7-10 cells, thick in the middle, margin obtuse of small cells.

Cosmopolitan.

Aneura longiflora, St.—Very variable. Procumbent, but generally with numerous erect branches, irregularly bipinnate, flaccid, brownish, often 3-4 cm. long, branches with expanded crenulate apices, mostly 3 mm. wide, flat, about 12 cells thick in the middle, tapering to the acute margins. Calyptra 8 mm. long, cylindric.

Lottah. Slopes of Mt. Wellington.

Distinguished by its short, flat branches, with simple acute margins.

f. submersa.—Dark. 4-5 cm. long, linear, with numerous short lateral branches, most of which are divided into many short, decurved, subterete pinnules.

Adamson Peak, in pools.

Aneura polymorpha, Col.—Very variable in shape. Procumbent, flaccid, broad, thin, and dark green. Branching very varied in shape and breadth, procumbent or erect, often 5 cm. long, flat and thin, seldom more than 5 cells thick in the middle; margins thin, but not winged. Calyptra small.

About Hobart. Possibly introduced. New Zealand. Readily distinguished by its flat, thin structure.

Aneura dentata, St.—Dark. Procumbent, flat or concave dorsally, robust, with many broad, short lobed branches, mostly 3-4 cm. long, 5-7 mm. wide, apices obtuse, with broad obtuse marginal lobes, 7-10 cells thick in the middle, margins acute, with one to many series of enlarged round or elongated, transparent cells. In the typical form the "margin everywhere, especially at apex, coarsely dentate, teeth remote, plano-conic, acuminate, 2-4 cells long."

Mt. Wellington. Blue Tier. New Zealand.

Very close to *A. colensoi*, but with a smooth surface and distinct margin.

Aneura colensoi, St.—Procumbent, robust, mostly 2-3 cm. long, tough, fleshy, with numerous short, broad branches, branches 2 mm. wide, bearing many rotund, rarely lengthened pinnules; margins obtuse, about 6 cells thick in the middle; surface thickened, covered with short, acute papillae.

Mt. Wellington. New Zealand.

The non-bordered obtuse margin and armed cuticle distinguishes the species.

Aneura stolonifera, St.—Very variable, robust, 6-8 cm. long to small, densely caespitose and under 1 cm. Base stoloniferous and terete, branches long or short, ascending or erect, flat, thick, and expanding to a broad, crenate apex, middle 10 cells thick, margin acute, marginal cells large, minutely lamellate, and often also minutely papillate. Calyptra narrow, clavate, 6 mm. long, inserted on the terete base.

Very common. Also throughout the Southern Hemisphere.

Distinguished by the enlarged striate marginal cells.

Aneura tasmanica, St.—Rather small, decumbent, seldom exceeding 1 cm., flat, much divided into short branches, 1-2 mm. wide, rarely suberect, and with expanded tips, very narrow, almost terete at the base, apex obtuse in section plano-convex, 8 cells thick in the middle, margin acute, but not winged, surface coarsely papillate. Calyptra large, broadly cylindric, coarsely papillose. Cortical cells 20 μ ., medullaries 60 μ .

Slopes of Mount Wellington.

Aneura crecta, St.—Procumbent, widely spreading, vaguely branched, yellowish-green or more or less brown, 1-2 cm. long, numerous branches, ascending or erect, about 5-10 mm. long, flat or concave, simple or seldom branched, 1-2 mm. wide, with obtuse apices, about 5 cells thick in the middle; dorsal cortical cells hexagonal and brown walled, ventrals longer, marginal cells often colourless, rectangular, but variable. Cortical cells 40 μ ., medullaries very large.

Very common.

Aneura cochleata, Hf. et T.—Medium size, densely pulvinate, the branches erect, and usually strongly concave at the tips. Branches simple, or with few lobes, erect, 2-3 mm. wide, broader and concave at the apex, 4-5 cells thick in the middle, margin acute, with one or two series of large quadrate hyaline cells, cortical cells rather large, those of the ventral surface of very irregular shape. Calyptra oblong, 2 mm., coarsely papillate.

Slopes of Mt. Wellington. New Zealand.

f. lichenoides.—Branches more lobed, flatter, and less erect.

Mt. Wellington.

Aneura alpicorne, Mitt.—Small, slender in dense, pulvinate masses or singly amongst moss, pale green or when exposed very dark, with green tips. Ascending, linear, or almost terete, to 1 cm. long, 0.3-0.6 mm. diameter. branches few, short or long, similar, biconvex, with obtuse margins, cortical cells, little smaller than the medullaries. Calyptra half-way up the branch, clavate 3 mm. long.

Small forms are very similar to *A. gracilis*, but the margins are obtuse, and the apex of the calyptra without the ring of pilose hairs of that species.

Mt. Wellington. Mt. Styx. Adamson Peak. Common in many localities. S. America.

Aneura palmata (Hedw.), Dum.—Bright green, transparent, in pulvinate masses. Primary shoot decumbent, flat, 2-3 cm. long, 2-3 mm. wide, alternately pinnate, pinnae very short, obtusely lobed, branches erect, simple, linear, 5-10 mm. long; ultimate pinnules 0.3 mm. wide and generally numerous and equal, margin obtuse, about 8 cells thick in the middle; cortical cells $50 \times 33 \mu$, medullaries 80-120 μ . Organs of reproduction on the sides of the expanded branches. Antheridial ovate-cylindric, pedunculate. Calyptra stout, papillate, 3 mm. long.

Common. Cosmopolitan.

Aneura minima (Carr et Pear), St.—Very small, in dense cushions. Trunk stoloniferous, much branched, branches ascending pinnate, about 5-10 mm. long, 0.3 mm. wide, linear, biconvex, 4 cells thick in the middle, margin acute of 2-3 series of colourless cells, more or less crenate. Calyptra clavate, 1.3 mm. long, apex with a ring of long pilose hairs. Cortical cells not smaller than the medullaries.

Mt. Wellington. East Australia.

Aneura gracilis, St.—Very small, in dense cushions, under 1 cm., the branches mostly about 5 mm. long and 0.4 mm. wide, trunk and branches linear, nearly flat, all similar, 3-5 cells thick in the middle, margins subacute, not winged, cells all equal. Calyptra 2 mm. long, with a ring of pilose hairs at the apex.

Very common.

Aneura perpusilla, Col.—Minute, appearing like a layer of green plush. Shoots 2-5 mm. long, 0.4 mm. wide, convex on the dorsal, flat on the ventral surface, 3-5 cells thick in the middle, margins acute, but not winged, cells all similar. Calyptra cylindric, 1-2 mm. apex with a ring of pilose hairs.

Probably Stephani's *A. gracilis* is but a rather larger form of this.

Mt. Wellington. New Zealand.

METZGERIA, RADDI.

Membranous, linear, dichotomously dividing; midrib slender, very distinct. of narrow elongated cells, within a large celled sheath; wings broad, one cell thick; margins, under surface and midrib, more or less bearing single or geminate bold hairs. Reproductive organs on small, special branches, arising from the ventral surface of the midrib. Perianth absent; calyptra thick, clavate or pyriform,

clothed with straight bristles. Gemmae on the ventral surface of the midrib, discoid, large, many-celled, smooth.

- Marginal hairs always single 2
- Marginal hairs mostly in pairs 3
- 2. Frond nearly flat, simple *furcata*
Wings split into involute lobes *saccata*
- 3. Midrib hairless *atrichoneura*
Midrib with hairs 4
- 4. Nerve sheath 2-celled on both sides ... *nitida*
Nerve sheath 2-celled dorsally, 4-celled
ventrally *conjugata*

Metzgeria furcata (L.), Dum.—Variable in size, mostly 1-3 cm. long, repeatedly forked, from under 1 to nearly 2 mm. diameter, flat, procumbent. Midrib prominent on the ventral surface and 4 cells broad, flat and 2-celled dorsally. Cells of the wings hexagonal, about 32 μ . diameter. Under surface more or less clothed with simple, straight hairs, usually numerous on the midrib, often absent from the wings, except a few just within the margin. Calyptra broadly clavate, covered with stiff hairs. Spores light brown, granular, about 25 μ ., diameter.

Very common. Mostly on bark. Cosmopolitan.

Metzgeria saccata, Mitt.—Seldom exceeding 1 cm. in length and 1 mm. in breadth, wings regularly segmented into reflexed saccate lobes, each about 2 mm. long; midrib flat and 2 cells wide on the dorsal surface, prominent, and 4-celled on the ventral, a few bold hairs on the margin between the lobes, none on the midrib, cells of the wing 32 μ ., Calyptra pyriform, 2.5 mm., coarsely strigose.

Mt. Wellington, Mt. Hartz, Adamson Peak, Freycinet Peninsula, etc. New Zealand.

Metzgeria nitida, Mitt.—Slender, ascending, often 3 cm. long, 1.5 mm. wide, margins recurved, midrib nearly flat, and 2-celled on both sides, hairs bold, few or copious on midrib and margin, those of the latter mostly in pairs; cells 45 μ .

Mt. Wellington, Russell Falls, West Coast, etc. New Zealand. S. America.

Metzgeria atrichoneura, Spruce.—Small and repeatedly branched, margin revolute, midrib flat and 2-celled dorsally, prominent, 2-3-celled ventrally; hairs in pairs, short, and confined to the margin; cells 45 μ .

Tasman Peninsula. New Zealand.

Metzgeria conjugata, Lindb.—Slender, often 3 cm. long, 1.5-2 mm. wide, margin recurved, midrib flat, 2-celled on the dorsal surface, produced, and 4-celled on the ventral; wings nude, but margin and midrib bearing many straight hairs, mostly in pairs; cells 45-60 μ . long; cuticle smooth.

East Coast. Cosmopolitan.

HYMENOPHYTUM, DUM.

Frond from a cylindric base, broadly membranous, decumbent or erect, simple to several times forked and fan-shaped above, midrib narrow. Archegonia on very short branches, arising from the ventral surface just below the membranous expansion, or at the lower fork; involucre bilobed; perianth clavate, with a fimbriate mouth; calyptra membranous. Antheridia on short, special branches on the ventral aspect of the midrib, or reduced to rotund cushions on the surface.

Frond fan-shaped *flabellatum*

Frond simple or once forked *phyllanthus*

Hymenophyllum flabellatum (Hook), St.—Fronds from a creeping cylindric stolon, erect, a long stalk and a 2-3 forked membranous fan-shaped head; midrib thin. Perianth arising on the ventral surface of primary or secondary forks, about 1 cm. long, surrounded at the base by a short bilobed involucre; lobes reniform to oblong; margin entire, obscurely toothed or irregularly spinous. Antheridia on discoid cushions on the ventral surface.

Stephani makes the typical form with more than two primary divisions to the fan, stalk not at all winged, midrib lost below the apex, and the involucre spinous.

He adopts Taylor's *H. leptopodium* as a good species. This is generally less robust, with the primary division simply dichotomous, stipes winged above, midrib percurrent, and involucre entire.

Tasmanian forms, whether small or very robust, seldom have more than two divisions in the first fork; the stipes is winged, but the midrib vanishes at a distance from the apex, and the involucre is seldom entire.

Abundant. Australia. New Zealand.

Hymenophyllum phyllanthus (Hook), St.—Fronds ascending, 2 cm., simple or once furcate, shortly stipitate, with broad wings above; midrib rather slender; wings thin, undulate; margin entire. Perianth on ventral aspect close below the expanded portion of the frond, cylindric,

6 mm., mouth fimbriate, calyptra delicate, shorter; involucre cupshaped, fimbriate. Antheridia on short ventral branches.

Common in shaded places. Australia. New Zealand.

PALLAVICINIUS, GRAY.

Frond cylindric below, expanding above into a decumbent or erect, simple or forked expansion; midrib bold, with a central strand of small cells. Archegonia in groups on the upper surface, surrounded by a short, cup-shaped fimbriate involucre; perianth cylindric, with a fimbriate mouth; calyptra about as long, membranous. Antheridia solitary, globose, biseriate on dorsal aspect of the midrib, each covered by a dentate scale.

Pallavicinius lyellii (Hook), Gray.—Decumbent, simple, or with branches arising from the midrib, sometimes forked, 3-4 cm. long, about 4 mm. wide; wings undulate, ascending; margin entire; midrib slender. Fruit about the middle of the frond; involucre short, fimbriate above; perianth 6 mm. long, cylindric, mouth fimbriate, calyptra often protruding beyond the perianth. Spores brown 26 μ , finely reticulated.

Cosmopolitan.

Pallavicinius connivens (Col.), St.—Erect from a cylindric rhizome, 1-2 cm., lower portion slender, cylindric, above 2-3 times forked, broadly winged, flabellate, edges involute, margin strongly dentate. Fruit towards the base of the primary fork, or on the dorsal surface of the midrib; involucre short, cup-shaped, with a fimbriate mouth; perianth broadly cylindric, 3-4 mm., mouth fimbriate; calyptra shorter than the perianth. Spores yellow, marked with short, sinuous, shallow ridges or irregular papillae, 30 μ .

Mt. Wellington Plateau. New Zealand.

SYMPHYOGYNA, MONT. ET NEES.

Fronds cylindric below, expanded and membranous above, simple or forked; midrib narrow, wings broad, membranous. Archegonia in small groups on the dorsal aspect of the midrib, involucre consisting of a single bract; perianth absent; calyptra bold, cylindric, membranous. Antheridia single, but many in rows on each side of the midrib, each contained in a small bract.

Margin entire *interrupta*

Margin dentate 2

2. Closely decumbent, midrib very prominent on ventral surface *rhodina*
Midrib rather flat 3
3. Midrib slender, wings decurrent, usually twice forked *hymenophylla*
Midrib bold, base of wings bluff, simple or once forked *obovata*

Symphygogyna interrupta, C. et P.—Delicate, procumbent or ascending, fronds to 2 cm., stipitate below abruptly expanded, with broad wings above, simple, or with few branches; midrib slender; wings in some instances interrupted; margin entire. Calyptra 5-7 mm. long; bract narrow, oblong, laciniate above; capsule cylindric. Spores 20 μ ., asperate.

Closely resembling *Podomitrium phyllanthus*, Mitt.
Slopes of Mt. Wellington. Eastern Australia.

Symphygogyna rhodina, Tayl.—Rosy, closely decumbent, about 1 cm. long, 2-3 mm. diameter, forked; dorsal surface concave, ventral with a deeply produced bold midrib; wings ascending, more or less dentate. Calyptra about 6 mm. long, bract deeply lobed; spores 20 μ ., asperate.

On clay bank, Huon-road. New Zealand.

Symphygogyna hymenophylla (Hook). St.—Fronde suberect, forked into a broadly obconic fan, membranous wings, broad, coalescing and decurrent below, margin coarsely dentate, midrib slender, vanishing in or below the obtuse apex. Calyptra slender, often exceeding 1 cm., apex fimbriate, and carrying sterile archegonia; bract oblong or quadrate, margin strongly dentate or fimbriate. Spores 18 μ ., papillate.

Apex occasionally with a flagellate rooting tip.

Very common. Australia. New Zealand.

Symphygogyna obovata, Tayl.—Fronde decumbent or ascending, about 2-3 cm. long, abruptly expanding, with broad, crisped membranous wings, simple or with few branches, midrib strong, attenuated towards the apex, margin rather regularly dentate. Calyptra about 1 cm. long, usually rosy, cylindric; bract deeply divided once or twice, fimbriate. Spores 22 μ ., yellow, with fine brown reticulations.

Very common. Australia. New Zealand.

TREUBIA, GOEBEL.

Frond procumbent, simple, or rarely with few lateral branches; midrib broad, passing imperceptibly into the wings. Wings sectioned off into lobular leaves, nearly horizontal, slightly succubous, large and with a short lobe towards the anterior base. Archegonia in a small group on the dorsal surface of the midrib, near the apex, surrounded by an involucre of numerous small scales. Perianth, none. Calyptra thick, clavate, about 1 cm. long.

Treubia insignis, Goebel.—About 3-6 cm. long, 1.5 cm. broad, fleshy, midrib prominent on the ventral surface, copiously covered with mucous.

Slopes of Mt. Wellington. Rare. New Zealand, Java, Samoa. Tahiti.

FOSSOMBRONIA, RADDI.

Stem slender, closely creeping on ground, simple or forked. Leaves in two rows, succubous, imbricate, erect. Archegonia on the dorsal surface of the midrib near the apex. Perianth large, more or less plicate, with a widely open mouth. Calyptra tender, pyriform.

Leaves entire 2

Leaves dentate *dentata*

2. Leaves green, closely imbricate ... *perpusilla*

Leaves reddish, loosely imbricate ... *intestinalis*

Fossombronia perpusilla (Col.), St.—Small, about 5 mm. closely procumbent. Leaves ascending, closely imbricate, quadrate, truncate to 3-4 lobed, undulate, cells 50-70 μ . Perianth erect, close to the apex, 2 mm. long, plicate, mouth wide, crisped. Spores 40 μ ., brown, surface armed with short, sinuous, bold lamellae, appearing in section as crowded blunt spines.

Very common on ground. New Zealand.

Fossombronia intestinalis, Tayl.—Small, but often 1-2 cm long, closely procumbent. Leaves imbricate, ascending, quadrate, undulate, broader than long, about 2 mm. long, cells mostly 50-70 μ . Perianth turbinate, about 2 mm. long, plicate, mouth broad, lobed. Spores black, 46-50 μ , surface reticulate, with bold, truncate papillae at the junction of the lamellae.

Distinguished by longer growth, looser foliage, and dark, rough spores.

Common in grassy places. East Australia. New Zealand.

Fossombronina dentata, St.—Closely creeping, mostly 1-2 cm., often reddish. Leaves closely imbricate, ascending, broadly ovate to retuse, 1.5-3 mm. long, margin usually armed with about 12 bold spines, sometimes fewer or much reduced, cells $40 \times 50 \mu$. to $50 \times 100 \mu$. Rest not seen.

Common on heaths.

JUNGERMANNIACEAE.

Archegonia terminating the main stem or lateral branch; sometimes the lateral branch basal, and so reduced as to break down the technical distinction from *Metgeriaceae*. Leaves always present (reduced to small lateral lobes in *Zoopsis*), flat and expanded, entire or variously armed, or divided, always arranged in two lateral rows, generally a third ventral row of smaller leaves is present. Sporophyte surrounded at the base by a membranous perianth, and an enlarged calyptra; perianth rarely absent. The base of the sporophyte, with its accompanying envelopes, often more or less sunk in the substance of the gametophyte shoot. When this tendency is great this part of the stem develops a ventral, descending, fleshy bag, the marsupium.

The family is very large. A few natural sub-families may be separated out, but the bulk of the genera do not present workable distinctions. Efforts have been made to group them in accordance with differences in structure of the perianth, but without a satisfying result. The following treatment is almost upon these lines, but depends more on leaf-shape. It is advanced not as being more natural, but as a more workable key to help the student.

SUB-FAMILY JUNGERMANNIOIDEAE.—Leaves succubous rarely, almost transverse, under-leaves absent, except sometimes in the vicinity of the archegonia.

- | | |
|---|---------------------|
| 1. Leaves entire, rarely retuse | 2 |
| Leaves bifid | 12 |
| 2. Sporophyte with a simple perianth or calyptra | 3 |
| Sporophyte inserted in a descending marsupium | 9 |
| 3. Perianth absent... .. | <i>Gymnomitrium</i> |
| Perianth present | 4 |
| 4. Perianth 2-lipped, flat, terminal... .. | <i>Plagiochila</i> |
| Perianth tubular | 5 |

5. Perianth towards the base *Adelanthus*
Perianth terminal 6
6. Leaves with an acute apex *Cuspidatula*
Leaf apex obtuse... .. 7
7. Leaves strongly succubous *Jamesoniella*
Leaves nearly transverse 8
8. Leaves entire *Aplozia*
Leaves retuse *Sphenolobus*
9. Plant procumbent 10
Plant ascending or erect 11
10. Marsupium cylindric *Symphyomitra*
Marsupium, short, broad *Alicularia*
11. Marsupium apical *Tylimanthus*
Marsupium basal *Marsupidium*
12. Small, green 13
Robust, rigid, reddish *Anastrophyllum*
13. Cuticle smooth *Sphenolobus*
Cuticle papillose *Acrobolbus*

SUB-FAMILY LOPHOCOLEIDAE.—Leaves succubous, relatively large, entire or dentate or sometimes 2-lobed; underleaves always present, nearly always much smaller than and very dissimilar to the leaves.

1. Sporophyte inserted in a perianth 2
Sporophyte in a marsupium *Saccogyna*
2. Perianth at a distance from the
apex *Chiloscyphus*
Perianth apical 3
3. Perianth triquetrous or cylindric,
mouth 3-lobed... .. *Lophocolea*
Perianth flattened and bilobed at the
mouth *Leptoscyphus*
Perianth trigonous, mouth dentate,
leaves with a thick margin *Odontoschisma*

SUB-FAMILY PTILIDIOIDAE.—Leaves usually small, incubous to transverse, rarely slightly succubous, bilobed to many lobed, lobes acute often spinous; underleaves present (except in some *Cephalozia*), similar to the leaves and often nearly as large. One species of *Lembidium* has entire leaves.

1. Leaves reduced to small lateral lobes;
underleaves rudimentary *Zoopsis*
Leaves not so reduced 2
2. Leaves bilobed 3
Leaves with more than 2 lobes rarely
bilobed in *Lepidozia* 6

3. Leaves divided below the middle 4
 Leaves divided to above the middle 5
4. Leaves robust strongly secund... *Chandonanthus*
 Leaves very small, erect *Herberta*
5. Underleaves small or absent; leaves
 minute *Cephalozia*
 Underleaves nearly as large as the
 leaves *Isotachis*
6. Perianth smooth 7
 Perianth hairy or scaly 8
7. Leaves incubous *Lepidozia*
 Leaves transverse. Stem erect and
 dendroid *Leucidium*
 Leaves succubous or transverse. Stem
 procumbent *Psiloclada*
8. Leaves with many spiney divisions;
 perianth with spiney hairs at the
 mouth *Blepharostoma*
 Leaves with numerous hair-like divi-
 sions; perianth scaley *Trichocolea*
 Leaves twice bifid, long acute, middle
 cells elongated *Lepicolea*

SUB-FAMILY BAZZANIOIDEAE.—Leaves incubous, entire or with 2-3 small terminal lobes, or margin ciliated; underleaves always present, not similar to the leaves.

Leaves 2-3 dentate or lobed *Bazzania*

Leaves entire or a few bilobed *Calypogeia*

Plant with numerous water-sacks on

ventral aspect *Lepidolaena*

SUB-FAMILY SCAPANIOIDEAE.—Leaves deeply divided into two lobes, the dorsal smaller than and closely pressed against the ventral lobe, in *Diplophyllum densifolium* the lobes are linear and equal.

Underleaves absent; leaf margin entire;

perianth present *Diplophyllum*

Underleaves usually present; fruit

terminal sunk in the hollowed apex

of the stem *Schistochila*

Underleaves bifid; fruit in a descending

fleshy bag *Balantiopsis*

SUB-FAMILY RADULOIDEAE.—Leaves incubous, very unequally 2-lobed, ventral lobe very small, and closely pressed against the large dorsal lobe; underleaves absent. Perianth long, tubular below, with a broad, flattened mouth.

Contains but one genus *Radula*

SUB-FAMILY JUBULOIDEAE.—Leaves incubous, very unequally 2-lobed, ventral lobe small, and more or less pressed against the larger dorsal lobe, rarely both lobes nearly equal; underleaves usually present. Perianth saccate with a very small often tubular mouth. Capsule not splitting to the base; many elators attached to the apex of each valve.

1. Ventral lobe convoluted to form a
water sack *Frullania*
Ventral lobe an involution on the
ventral margin *Lejeunia* group

GYMNOMITRIUM CORDA.

Small, growing in dense masses. Leaves imbricate, concave, entire or bifid, apex usually colourless. Underleaves none. Perianth none; calyptra terminal; capsule globose on a short seta; upper leaves enlarged, bracts smaller and colourless.

Gymnomitrium concinnum (Lightf) Corda.—Stems small, slender, about 5 mm. long, pale green tinged with red or yellow. Leaves closely imbricate in two opposite rows closely appressed to the stem, oblong, 1 mm. mostly $\frac{1}{2}$ bilobed, sometimes notched or entire, margin hyaline; cells about 20 μ ., cuticle minutely verruculose. Bracts many deeply lobed; inner ones laciniate.

Our plant has been referred to *Acolia stygia*, but that has entire less crowded leaves.

Mt. Wellington Plateau.

Cosmopolitan.

In exposed situations on mountains the leaves are more closely appressed and entire; marginal cells elongated and irregular, forming an erose colourless border.—*Cesia erosa* C. et P.

PLAGIOCHILA, DUM.

Large to medium, never very small, green or more or less tinged with brown, shoots ascending from a leafless rhizome, simple or more often with lateral branches. Leaves succubous, base narrow, oblique with the dorsal margin reflexed; underleaves absent. Perianth terminal, with a broad, laterally flattened, bilobed or truncate mouth; floral leaves large. Antheridia in terminal spikes.

Plants of the deltoid group vary in habit and structure. It is very difficult to define specific limits, and numerous species have been described from limited herbarium material. In all the species the dentition of the margins and size of trigones vary greatly.

1. Leaves deltoid; dorsal margin nearly straight, ventral strongly curved ... 2
 Leaves subovate to rotund ... 6
 Leaves obcuneate to narrowly obovate ... 13
2. Leaves broader than long ... 3
 Leaves longer than broad ... 4
3. Leaves 3-4 mm. strongly dentate ... *deltoidea*
 Leaves 2 mm. margin undulate,
 seldom with a few teeth ... *microdictyum*
4. Leaves obliquely ovate, apex narrow ... 5
 Leaves obliquely oblong, apex broad *fasciculata*
5. Dorsal margin nearly straight and plain ... *strombifolia*
 Dorsal margin curved, usually with a few bold teeth ... *lyallii*
6. Margin many dentate ... 7
 Margin plain or few dentate ... 10
7. Teeth minute ... 8
 Teeth bold ... 9
8. Dorsal base abruptly inserted ... *fuscella*
 Dorsal base decurrent ... *taylori*
9. Both margins armed ... *retrospectans*
 Dorsal margin nude ... *biserialis*
10. Leaves rotund ... *circinalis*
 Ventral margin much expanded ... 11
11. Leaves rigid, strongly decurved... *decurvifolia*
 Leaves erect appressed ... 12
12. Leaves brownish ... *pusilla*
 Leaves pale green flaccid ... *radiculosa*
13. Leaves 1.5 mm., surface obtusely papillate ... *pleurata*
 Leaves much smaller, surface smooth ... *incurvicolla*

Plagiochila deltoidea, Lindb.—Robust, short and simple to 10 cm., and branched. Leaves crowded, imbricate, deltoid, 3-4 mm. long, very oblique and a similar breadth, dorsal margin strongly reflexed, lightly curved and mostly nude, base shortly decurrent, ventral margin very expanded from apex to base, often conniving with the opposite leaves to form a crest, apex and ventral margin variously armed with few to many bold teeth; cells averaging 24 μ ., walls thick, trigones large. Perianth immersed in large floral leaves, mouth broadly truncate, spinulose, dorsal margin with a narrow dentate wing above.

Very common.

East Australia. New Zealand.

Plagiochila microdictyum, Mitt.—Small, simple, rarely exceeding 5 cm. Leaves crowded, shaped as in *P. deltoidea*, about 2.5 mm. long and rather broader, apex and ventral margin undulate, nude or rarely a few irregular or many very small teeth; cells 20 μ , trigones as large as the cells, walls sinuous.

Mt. Wellington. Adamson Peak. New Zealand.

Plagiochila fasciculata, Lindb.—Usually tall, slender, and freely branched. Leaves imbricate, obliquely ovate; trigonous or rather oblong, 2-3 mm. long, dorsal margin nearly straight and nude below, ventral margin boldly curved from apex to base, and armed with few or many spinous teeth; cells averaging 20 μ , trigones rather small. Perianth hardly exerted, mouth truncate, coarsely spinous.

Distinguished from *P. deltoidea* by the smaller, narrower leaves.

Very common.

New Zealand. Auckland Island. East Australia.

Plagiochila strombifolia (Taylor), Lehm.—Usually robust and branched. Leaves obliquely ovate, with an obtuse apex, about 2.5 mm. long, dorsal margin nearly straight, lightly reflexed, nude, ventral margin expanded, but not extremely so, armed with short, broad acute teeth; cells 27 μ , walls rather thick, trigones medium. Perianth shortly exerted, mouth rotund, armed with spinous teeth.

The straight dorsal margin distinguishes it from the last; the smaller more ovate leaves from *P. deltoidea*.

Very common.

Plagiochila lyallii, Mitt.—Usually tall and branched. Leaves not crowded, obliquely ovate, 1.5-2 mm., dorsal margin lightly curved, usually with a few bold teeth, ventral margin more strongly curved, but not ampliate, armed with strong, broad spinous teeth; cells about 16 μ ; trigones small or none. Perianth shortly exerted, mouth very broad and armed with spinous teeth.

Less crowded leaves, narrower apex and fewer teeth mark its distinction from *P. fasciculata*.

Very common.

New Zealand.

Plagiochila fuscella, Hf. et T.—Rather small for the genus, seldom exceeding 3 cm., usually many branched. Leaves with a nearly transverse very narrow insertion, subrotund, 3 mm. long, dorsal margin curved, slightly deflexed, nude, apex and ventral margin very broadly

curved, ampliate below, armed with numerous minute teeth; cells 12-16 μ ., walls thick, trigones none, marginal cells strongly incrassate.

Near Emu Bay.

Auckland Islands.

Plagiochila taylori, St.—Slender, many branched, to 7 cm. long. Leaves not crowded, obliquely ovate to nearly rotund, 2-3 mm., base narrow, apex obtuse, dorsal margin lightly reflexed, nude, base rather decurrent, ventral margin strongly curved from apex to base, armed with numerous or few minute teeth; cells 18 μ ., trigones small, walls straight or slightly sinuous. Perianth long exserted, oblong, mouth truncate spinulose.

Very close to *P. fuscella*, with a more ovate leaf and decurrent dorsal base.

Mt. Wellington, West Coast.

Plagiochila retrospectans, Nees.—About 5-7 cm., many branched. Leaves erect, appressed, broadly ovate, 3 mm., everywhere armed with numerous teeth of mixed sizes, rarely all small, and usually an apical tooth larger than the rest, ventral more curved than the dorsal margin; cells very irregular, 10-20 μ ., trigones large, rotund, walls more or less sinuous, several series of cells at the margin with strongly thickened walls. Perianth half exserted, mouth with long fimbriae.

Very common.

Eastern Australia.

Plagiochila biserialis, L. et L.—Usually about 4 cm. and unbranched. Leaves crowded, erect, closely appressed, nearly rotund, 1-1.5 mm. long, dorsal margin strongly curved, nude below and slightly deflexed, terminating in a bold apical tooth, ventral margin more curved, armed with about 10 unequal, bold teeth, getting smaller from above downwards; cells 25 μ ., trigones very large, walls sinuous. Perianth exserted, very flat, mouth rotund armed with few teeth.

West Coast, Adamson Peak, Mt. Hartz, Cradle Mt., etc.

Plagiochila circinalis, L. et L.—Rigid, simple or few branched, about 3 cm. Leaves erect, obliquely ovate-rotund, 2 mm., dorsal margin curved with a rather decurrent base, ventral margin rotund, margins nude, undulate or with a few irregular teeth; cells 18 μ ., trigones very

large. Perianth long, narrow, not much flattened, mouth rotund, armed with short spines.

Mt. Wellington, Cradle Mt., etc.

New Zealand, Campbell Islands.

Plagiochila decurvifolia, St.—Seldom branched, up to 6 cm. long. Leaves crowded, erect, and closely imbricate, broadly obliquely ovate, very obtuse, about 2 mm. long, dorsal margin nearly straight, strongly reflexed, base sub-decurrent, ventral margin deeply rotund undulate occasionally with a few irregular teeth towards the apex; cells about 20 μ , trigones as large as the cells. Perianth oblong freely exserted. Very close to *P. magellanica*, Lindb.

West Coast. Hartz Mts.

New Zealand.

Plagiochila pusilla, Mout.—Usually 1-2 cm., sometimes longer, dull green, generally with descending stolons. Lower leaves small, entire, obliquely reniform; upper leaves about 2 mm. long, nearly rotund but the ventral side ampliate, margin more or less dentate, dorsal margin slightly reflexed, insertion abrupt; cells 30 μ , walls thick, trigones large confluent.

Mt. Faulkner. West Coast.

Auckland Islands.

Plagiochila radiculosa, Mitt.—Flaccid, many branched. Leaves pale green, crowded erect, appressed broadly ovate-trigonus up to 4 mm. long, much smaller below, dorsal margin nearly straight, entire, ventral margin broadly expanded entire, apex rotund or narrow truncate with two small teeth; cells mostly 30-35 μ , trigones medium acute to convex, sometimes larger and rotund.

Mt. Wellington. Adamson Peak.

Plagiochila pleurata, Hf. et T.—Usually under 2 cm., simple or with few branches, rather rigid. Leaves narrow obovate from a narrow base, slightly asymmetric, 1.5 mm. long, dorsal margin slightly curved, nude, apex truncate with 2-3 bold teeth, ventral margin more curved with few short broad obtuse teeth; cells 18 μ ; surface with many very short rotund papillae.

It has a resemblance to small forms of *P. lyallii*.

Mt. Wellington. West Coast.

Plagiochila incurvicolla, Hf. et T.—Small, seldom exceeding 2 cm. rigid, usually simple. Leaves small, seldom

exceeding 0.6 mm., narrow obovate from a narrow base, dorsal margin lightly curved, nude, ventral margin more strongly curved, apex and ventral margin armed with about 7 bold broad teeth; cells 18 μ ., walls thick, trigones none, cuticle smooth.

Very close to *P. pleurata*, but smaller with a smooth cuticle.

Mt. Wellington.

New Zealand.

ADELANTHUS, MITT.

Stems erect from a creeping rhizome, simple or with few long branches, apex usually circinate. Leaves succubous, rotund, margins incurved, entire or minutely dentate; cells rotund, walls thick; underleaves none or rudimentary. Perianth fusiform on a short branch towards the base of the stem, mouth contracted. Calyptra fleshy.

Distinguished from rotund leaved *Plagiochilae* by the margin being inflexed not reflexed. From *Jamesoniella* by the different habit and dentate upper leaves.

Adelanthus falcatus, Mitt.—Usually 2-4 cm. Leaves erect appressed rotund, 0.8-1.2 mm. diameter, dorsal base decurrent, ventral rotund, lower leaves entire, upper ones often dentate; cells quadrate with thick walls, lower cells longer with thinner walls. Perianth 2-3 mm. long.

Very common.

New Zealand.

CUSPIDATULA, ST.

Small, decumbent simple or with few branches. Leaves crowded, secund on the dorsal aspect, ovate with a broad base and acute apex, succubous; cells rotund, walls thick, trigones large confluent; underleaves none. Perianth terminal large, ovate-cylindric, plicate, mouth narrow lobed also with numerous filiform fimbriae; bracts and bracteole larger than the leaves, deeply bifid and dentate.

Very close to *Anastrophyllum*.

Cuspidatula monodon (Hf. et T.), St.—Leaves 1.3 mm. broadly ovate, imbricate, apex spinous, ventral margin often with a rudimentary lobe.

On most mountains.

Australia. New Zealand.

JAMESONIELLA, SCHIFFN.

Decumbent or erect, generally rigid few branches. Leaves succubous, entire rotund to oblong, imbricate, margins inflexed or flat; cells rotund with thick walls seldom with apparent trigones; underleaves absent except in the floral region. Perianth terminal, cylindric, plicate, mouth rather contracted; bracts as short as or shorter than the leaves more or less divided into linear lobes.

- | | |
|--|--------------------|
| 1. Cuticle verrucose | <i>colorata</i> |
| Cuticle smooth | 2 |
| 2. Leaves under 1 mm. appressed | <i>teres</i> |
| Leaves larger | 3 |
| 3. Leaf base constricted | 4 |
| Leaf base broad | <i>tasmanica</i> |
| 4. Leaves erect or nearly so | <i>grandiflora</i> |
| Lower leaves squarrose | <i>sonderi</i> |

Jamesoniella colorata (Lehm.), Spruce.—Decumbent, matted, wiry, tinged with yellowish-red. Leaves closely imbricate, rotund, margins slightly inflexed, base narrow, dorsal base straight but not decurrent, ventral rather more rounded, 1 mm.; cells 27 μ , walls thick continuous with the trigones, cuticle coarsely verrucose. Perianth narrow cylindric irregularly grooved, mouth narrowed with short, broad irregular fimbriae; bracts about as long as the leaves, quadrate, shortly fimbriate, bracteole broadly lanceolate.

Very common.

Southern Hemisphere, widely distributed.

Jamesoniella grandiflora (L. et G.), Spruce.—Decumbent, wiry, matted, nearly black. Leaves imbricate but often more or less recurved, broadly oblong, 1-1.7 mm. margin slightly inflexed, both bases rather acute; cells subquadrate mostly about 14 μ , becoming very much larger towards the centre and base, walls rather thick, trigones none, cuticle smooth. Perianth narrow-cylindric grooved, about 4 mm., mouth irregularly lobed; bracts rather longer than the leaves, very variable in armature, sometimes with only a few fimbriae towards the dorsal apex, at others variously laciniate; bracteole long. and very slender, with few slender lacinae.

Mountain plateaux.

South America.

Jamesoniella teres, C. et P.—Small, wiry, green tinged with red. Leaves imbricate, closely appressed oblong 0.5 mm., base broad, apex obtuse soon weathering; cells 18 μ , walls rather thin, trigones not apparent. Perianth

terminal but usually thrown to the side by a ventral innovation, oblong, grooved, mouth not much constricted, with many short irregular lobes.

Mt. Wellington. Mt. Field. Mt. Hartz, Etc.

Jamesoniella tasmanica (Tayl.).—Decumbent, not wiry, green or tinged with red. Leaves imbricate, erect on the young, spreading and decurved on the older shoots, ovate-rotund, base not at all constricted, flat, up to 2 mm. long; cells 24 μ ., trigones small, concave. Much confusion has occurred by some authorities having confused *J. colorata* with this.

Mt. Hartz. St. Mary's.

Jamesoniella sonderi (G.), St.—Stems rigid generally simple and erect in dense mats. Upper leaves erect, imbricate, obovate 2 mm. long, lower ones squarrose almost transverse; cells quadrate 18 μ ., walls thick, trigones none. Perianth oblong, 6-12 deep plaits, mouth contracted irregularly dentate; inner bracts shorter than the leaves with many laciniae; bracteoles oblong, lacinate.

West Coast. Western Tiers.

APLOZIA, DUM.

Small, ascending or slightly branched. Leaves oblong to rotund, succubous, obliquely inserted entire. Underleaves generally absent. Floral leaves similar to the stem leaves but larger. Perianth free or slightly combined with the bracts pyriform to fusiform, plicate, mouth contracted. Cells mostly about 30-35 μ ., with thin walls.

1. Perianth suddenly contracted to form
a small tubular mouth *rotata*
Perianth gradually contracted 2
2. Perianth with a deep broad ventral
groove, mouth shortly lobed *alpina*
Perianth 3 plicate, mouth deeply
lobed, usually torn *lacerata*

Aplozia rotata (Mitt.).—Stems mostly 5-10 cm., simple. Leaves rotund to broadly oblong, nearly transversely inserted, not closely overlapping, 0.5-0.7 mm., bracts rather larger. Perianth about 2 mm., pyriform deeply 4 plicate above, apex abrupt with a small tubular mouth. All parts more or less red.

In shade the bracts are little larger than the leaves. In exposed places at a high altitude they are often as long as the perianth.

Mt. Wellington. Longley.
New Zealand.

Aplozia alpina, Rod.—Stem weak slender, often 2-3 cm., green. Leaves mostly distant rotund, concave, nearly transverse, mostly 0.7 mm.; cells 17 μ .; bracts similar to and about the size of the other leaves, free from the perianth. Perianth fusiform tapering to a shortly 3-lobed or nearly entire mouth, dorsal surface with an obtuse keel, ventral surface with a broad deep groove, 2 mm. long. Stunted forms have a shorter perianth with a wider 3-lobed mouth and often a shortly bifid bracteole.

Mt. Wellington Plateau. Cradle Mt.

Forma stipulata.—In dense cushions, more robust, branches often stoloniferous. Underleaves present, oblong, rudimentary to half as long as the leaves.

Cradle Mt.

Aplozia lacerata, Rod.—Stems short in cushions, but often hidden amongst moss or buried in humus bearing only a few leaves in the upper portion, tender and pale, sage-green. Leaves almost transverse oblong to nearly rotund, concave 0.7 mm.; cells 27 μ ., walls thin. Bracts much longer than the leaves, narrow oblong, apex slightly fimbriate, bracteole nearly as long as the bracts, ovate obtuse, all adnate to the base of the perianth. Perianth cylindric with three shallow plaits little longer than the bracts, mouth narrow to little constricted, deeply 3-lobed, lobes narrow laciniate.

Mt. Wellington Plateau.

SPHENOLOBUS (LINDB.), ST.

Plants usually small, decumbent to erect; branches few from the ventral angles of the leaves. Leaves small, transversely inserted, 2-lobed or nearly entire, base decurrent or sheathing; cells rotund; underleaves absent or rudimentary. Perianth terminal, ovate to cylindric, more or less contracted at the apex.

Very close to *Lophozia*, but the leaves more concave and transversely inserted.

Sphenolobus perigonalis (Tayl.), St.—Very slender, usually about 1 cm. long, dark livid green. Leaves oblong, not crowded, decurving above, base broad stem-clasping, apex to $\frac{1}{4}$ bifid, lobes broad obtuse, 0.6 mm. long; cells 14 μ ., cuticle irregularly nodulose. Bracts usually broad, shortly 3-lobed 1.3 mm.; perianth broadly oblong, 2 mm., 3-5 plicate, mouth contracted with 3-5 short irregular lobes, but perianth varies much in length, and is often quite cylindric, with a very small contracted mouth.

Mt. Wellington. Mt. Field. Western Tiers.

New Zealand. Auckland Islands.

Forma submersus.—Leaflobes shorter, cuticle smooth. Bracts not enlarged; perianth wholly exerted oblong, not plicate, 3 mm., mouth suddenly contracted, shortly fimbriate.

Lake Leila, Cradle Mt.

Sphenolobus nigrus, Rod.—Small densely clustered in blackish cushions, the shoots simple or with few branches, about 1 cm. long. Leaves obcuneate from a narrow base, spreading, to $\frac{1}{2}$ bifid, lobes broad, apex rather acute 1 mm. long; cells 14 μ ., with very thick walls, cuticle smooth. Bracts similar to the leaves only larger, connate with an oblong bracteole. Perianth broadly cylindric, deeply 5-grooved, 2 mm. long, mouth closely contracted with a few short fimbriae.

On rocks in rivulet, Cradle Mt.

ALICULARIA, CORDA.

Small, ascending or procumbent, little branched with numerous ventral rhizoids. Leaves succubous obliquely inserted, rotund to oblong, entire; underleaves rudimentary, lanceolate or none. Bracts enlarged round the thickened apex, which forms a short broad marsupium; perianth tender, more or less connate with the bracts and wall of the marsupium.

Alicularia tenella, Rod.—Decumbent or ascending, dispersed amongst other small plants rarely forming mats. Leaves ascending, flat or slightly concave, oblong to rotund, rather delicate and flaccid, 1 mm. base sub-decurrent; cells 32 m., trigones small or none, cuticle smooth. Marsupium short and broad, bracts very large.

Mt. Hartz. Adamson Peak. St. Patrick's Head. Cradle Mt., Etc.

ACROBOLBUS, NEES.

Stems prostrate with bunches of rhizoids from the under surface. Leaves succubous, bilobed with unequal lobes, erecto-connivent near the inflorescences. Underleaves absent or rudimentary. Sporophyte inserted in the base of a terminal marsupium; perianth absent; calyptra adnate with the inner wall of the marsupium.

Acrobolbus cinerascens (L. et L.), Schffn.—Small, usually matted, pale green. Leaves plano-distichous, oblong about 1-3rd bifid, lobes unequal, 1-1.3 mm., margin plain; cells 35 μ ., trigones rather large, convex, cuticle coarsely papillose.

Mt. Wellington. West Coast.

Australia. New Caledonia. New Zealand.

Forma attenuata.—Elongated to 6 cm. amongst moss; leaves 0.5 mm., cells 15-20 μ ., trigones very small concave; cuticle intensely papillose.

Mt. Wellington.

Acrobolbus unguiculatus (Tagl.), Mitt.—Closely creeping on ground, pallid green, often to 4 cm. Leaves reniform, symmetric, ventral base rotund, dorsal nearly decurrent, to 1-3rd emarginate-bilobed, deeply spinulose with 8-16 large teeth; underleaves present very small; cells 26 μ ., lower ones much larger, trigones large sub-nodulose. Marsupium cylindric.

Huon River.

Australia. New Caledonia. New Zealand.

SYMPHYOMITRA, SPRUCE.

Decumbent, simple or with innovations from the upper leaf axils. Leaves succubous, alternate entire; underleaves none. Sporophyte terminal in a descending cylindric marsupium.

Symphyomitra drummondii (Mitt.), St.—Closely decumbent on the ground, stems simple, mostly under 1 cm., flagella arising from the ventral surface. Leaves distichous, convex, broadly ovate-triangular from a very broad base 0.7-2 mm. long; cells 32 μ ., cuticle smooth. Marsupium very long.

Very common on ground.

Australia. New Zealand.

Forma papillosa.—Cuticle covered with very short obtuse dome-like papillae. Every condition between this and the smooth cuticle of the type occurs on damp heaths.

Symphyomitra concinna (Mitt.), St.—Yellow rigid, prostrate, bearing radicles on the ventral surface. Leaves reniform concave imbricate rigid and brittle, margin hyaline, 1.5 mm., both bases abruptly inserted rotund; cells 18-24 μ ., trigones large convex to huge and confluent, cuticle asperate or sometimes smooth.

Recherche. Mt. Hartz.

Campbell Islands.

TYLLMANTHUS, MITTEN.

Stems simple or with few branches, erect or decumbent from a creeping rhizome. Leaves succubous, obliquely inserted, distichous, remote, apex truncate to shortly and unequally bilobed, otherwise entire or irregularly dentate; cells rather large, thickened at the angles, cuticle generally

rough, in few species smooth. Underleaves none. Archegonia in a terminal group. Sporophyte-base sunk in an oblong fleshy marsupium. Capsule oblong on a long seta.

When sterile readily distinguished by the pale bright green colour as well as the structure.

- | | |
|---------------------------------|----------------------|
| Robust. Cuticle smooth | <i>saccatus</i> |
| Medium. Cuticle asperate | 2 |
| Small. Cuticle papillose | <i>viridis</i> |
| 2. Leaves obovate | <i>flaccidus</i> |
| Leaves rectangular | 3 |
| 3. Basal cells asperate | <i>tenellus</i> |
| Basal cells striate | <i>angustifolius</i> |

Tylimanthus saccatus (Hook.), Mitt.—Stems mostly erect, 5 cm., forming mats. Leaves from broadly rectangular and little truncate to reniform or oblong and unequally bilobed, margin from closely dentate to entire, to 4 mm. long; cuticle smooth or some cells minutely asperate. Marsupium nearly 1 cm. long clothed with coarse hairs.

Very common.

Australia. New Zealand.

Tylimanthus tenellus (Tayl.), Mitt.—Slender decumbent. Leaves rectangular, 1.5 mm., sometimes much smaller, dorsal base decurrent, ventral abrupt or with an upward curving, apex unequally bilobed, variable, entire or with few teeth; cuticle with minute obtuse asperities. Marsupium covered with villous hairs.

Very common.

Australia. New Zealand.

Tylimanthus flaccidus, Berg.—Slender, decumbent. Leaves narrow obovate, decurved 1.5-3 mm., base hardly decurrent, dorsal straight, ventral constricted, apex unequally bilobed, more or less dentate; cuticle covered with minute obtuse asperities. Marsupium 4 mm., coarsely setose.

Very close to *T. tenellus*.

Hartz Mts. Mt. Field. West Coast, Etc.

Australia. New Zealand.

Tylimanthus angustifolius, St.—Stems about 5 cm. long, decumbent. Leaves oblong-rectangular, base not constricted, up to 4 mm. hardly decurrent, sides parallel, nude, apex unequally bilobed, with few teeth. Cuticle of upper cells very slightly asperate, lower ones striate verrucose.

Tasmanian specimens referred to this by Stephani are not typical, and are probably strong plants of *T. tenellus*.
Recherche.

Blue Mountains.

Tylimanthus viridis, Mitt.—Very slender, decumbent amongst other small plants. Leaves nearly quadrate, 1-3rd unequally bifid, 1 mm., cuticle coarsely papillate.

Adamson Peak. Hartz Mts. West Coast. Trowutta, etc.

South America.

MARSUPIDIUM, MITTEN.

Stems short erect from a creeping rhizome. Leaves succubous, relatively large, crowded, obliquely inserted, very concave, dorsal bases connivent, margin entire or variously armed; cells large, angles thickened, cuticle smooth to coarsely verrucose. Underleaves none. Archegonia in a terminal group on a short basal branch. Sporophyte inserted in a fleshy marsupium. Marsupium pendulous on a short lateral stalk placed at the base. Capsule oblong on a long thick seta.

- | | | | | | | |
|------------------------------------|-----|-----|-----|-----|-----|--------------------|
| Margin entire or nearly so | ... | ... | ... | ... | ... | 2 |
| Margin armed | ... | ... | ... | ... | ... | 3 |
| 2. Plant flaccid, dark green | ... | ... | ... | ... | ... | <i>abbreviatum</i> |
| Plant rigid, light green | ... | ... | ... | ... | ... | <i>succulosum</i> |
| 3. Margin lobed; cuticle papillose | ... | ... | ... | ... | ... | <i>setulosum</i> |
| Apex bispinous; cuticle smooth | ... | ... | ... | ... | ... | <i>piliferum</i> |

Marsupidium abbreviatum (Tayl.).—Flaccid, dark green, simple, 1-2 cm. Leaves rotund or reniform from a narrow subdecurrent base 2-3 mm., margin entire or with a slight apical truncation; cuticle smooth.

Adamson Peak; West Coast; Trowutta, Etc.

Auckland Islands.

Marsupidium succulosum (Nees), Schiff.—Stem about 2 cm. rigid. Leaves concave, imbricate, rotund to reniform 1.5 x 2.5 mm., margin armed with a few short teeth or entire; cuticle smooth. Marsupium 4 mm., seta nearly as long as the stem, thick.

West Coast. Mt. Hartz.

Eastern Australia.

Marsupidium setulosum, Mitt.—Flaccid, densely caespitose 2-3 cm., stem thick covered with papillose hairs. Leaves concave, broadly ovate 2.5 mm., margin irregularly lobed and dentate; cuticle coarsely papillose.

Mt. Faulkner.

New Zealand.

Marsupidium piliferum, St.—Small, rigid, erect. Leaves crowded, closely imbricate, concave, 1-1.5 mm., rotund to oblong with 2 filiform spines towards the apex otherwise entire; cuticle smooth.

Adamson Peak. Trowutta. Cradle Mt.
Eastern Australia. Chile.

ANASTROPHYLLUM (SPRUCE). St.

Robust and rigid, simple or with few branches arising from the ventral angles of the leaves. Leaves succubous or nearly transversely inserted, strongly secund, base stem-clasping, apex unequally bifid; cells with sinuous walls and large trigones. Underleaves none. Bracts rather larger, usually armed; perianth terminal cylindric, plicate above, mouth constricted laciniate.

Anastrophyllum schismoides (Mönt.). St.—Dark red, usually 3-6 cm. Leaves crowded, imbricate, conduplicate, asymmetric, ventral margin longer and more strongly curved than the dorsal, 1-3rd bifid, lobes broad not very acute, sinus broad, 1.3 mm.; cells 16 μ , trigones as large as the cells, cuticle smooth, bracts similar to and not much larger than the leaves; perianth 3 mm.

Adamson Peak. Hartz Mts. Blue Tier, Etc.
New Zealand. South America.

Anastrophyllum tasmanicum, Rod.—Robust, pale olive green, branching 3-4 cm. Leaves not strongly secund, almost squarrose nearly symmetric, to 1-3rd bilobed, lobes nearly equal, broad, usually with a very acute apex, margin just above the ventral base armed with a few acute teeth, 1.4 mm.; cells 20 μ , cuticle coarsely verrucose. Perianth narrow ovate, 3 mm., with about 8 deep plaits.

Adamson Peak. Mt. Hartz.

Very like *Chandonanthus squarrosus*, but the complete absence of underleaves and paraphylls distinguishes it.

SACCOGYNA, DUM.

Robust, decumbent, with few branches from the ventral surface. Leaves succubous, nearly opposite, entire or with two unequal and irregular teeth, dorsal base decurrent; underleaves large, bifid. Sporophyte inserted in a fleshy marsupium remote from the apex.

General appearance strongly resembles *Chiloscyphus* of the *Ch. coalitus* type.

Saccogyne australis, Mitt.—Long slender, yellowish green. Leaves plane, squarrose, ovate-triangular, slightly

decurved, base very broad, dorsally strongly decurrent, ventrally abrupt, 2.5 mm., apex narrow-rotund to shortly bidentate; cells 27-32 μ ., trigones small, cuticle covered with small short subacute papillae. Underleaves large, erect, concave, 1-3rd bidentate, broadly oblong, usually free.

Described by Mitten as *Lophocolea decurva*.

Longley.

New Zealand.

Saccogyna asperima, St.—Decumbent branching 1-2 cm., reddish-green. Leaves crowded erecto-homomallous imbricate ovate asymmetric, 1.5 mm., dorsal margin substrict, ventral ampliate, apex subacute entire or bidentate; cells 27-36 μ ., trigones medium convex, cuticle covered with large acute asperities; underleaves half as large as the leaves, rotund imbricate free, apex with a shallow sinus to $\frac{1}{2}$ bidentate.

The leaves are smaller than in *S. australis*, the apex more often entire, and the underleaves not so closely appressed.

Cradle Mt. West Coast.

LOPHOCOLEA, DUM.

Generally large to medium, rarely small, procumbent; branches few, ventral. Leaves tender, succubous, entire, retuse or bidentate, rarely with marginal teeth. Underleaves always present, small, generally bifid, margins plain to more or less dentate, the marginal teeth sometimes as long as the terminal lobes, rarely reniform with 4-6 spinous teeth; free or connate with the leaves on one or both sides. Cells rotund, mostly 20-30 μ diameter, walls generally thin with small or no trigones, rarely the trigones are rather large and rotund. Bracts similar to the leaves, only larger and often more dentate. Perianth usually terminating main shoots, rarely on lateral branches, generally long and triquetrous with a 3-lobed mouth, angles rarely winged, occasionally cylindric. Calyptra delicate. Capsule spherical on a long stalk. Antheridia in a fold at the dorsal insertion of the stem leaves.

A very large genus. The species vary considerably, and are correspondingly difficult to determine. It is seldom that any character can be received as constant. Most of Stephani's new species are here described from specimens determined by him, but some of these appear more as extreme forms than good species.

Group A. Leaves small, rigid, erect, entire or emarginate, *not decurved when fresh nor crumpled when dry.*

1. Trigones large 2
 Trigones minute 4
2. Underleaves relatively large free 3
 Underleaves very small connate ... *ercipulata*
3. Very small green, underleaves bifid
 *angulistipula*
 Leaves 2 mm., underleaves subcucul-
 late, regularly denticulate *tumida*
4. Underleaves nearly as large as the
 leaves, 1-3rd bifid *novae-zelandiae*
 Underleaves very small 5
5. Underleaves free *dargonia*
 Underleaves connate with leaves ... *ercipulata*

Group B. Leaves medium to large, *erect with a more or less decurved apex*, rotund to triangular, entire or rarely retuse, or some leaves slightly bidentate, or in some species the margin slightly armed.

1. Leaf margin always plain strongly
 decurved 2
 Leaf margin often armed, apex not
 strongly decurved 6
2. Leaf at least as long as its base 3
 Base of leaf exceeding its length 4
3. Underleaves narrow, deeply bifid *canaliculata*
 Underleaves mostly 4-fid. ... *heterophylloides*
 Underleaves oblong-rotund, shortly
 bifid *cordifolius*
4. Leaf ovate-rotund *gunniana*
 Leaf more or less retuse 5
5. Trigones none *forsythiana*
 Trigones medium acute *gehechii*
6. Leaves mostly under 1 mm. long... *lauterbachii*
 Leaves exceeding 2 mm. 7
7. Leaves reniform erect crowded *rupicola*
 Leaves ovate-triangular subplano-
 distichous *fissistipula*

Group C. Leaves mostly ovate-triangular, apex more or less retuse, sometimes rotund or a few leaves bifid, medium to large, erect or decurved, but *flaccid and crumpled when dry.*

1. Underleaves relatively large, seldom
 deeply bifid, margin with small teeth
 or entire 2

- Underleaves seldom twice as broad
as stem 2-3rd bifid, margin usually
armed with 1-2 acute teeth 6
2. Leaves 1-1.5 mm. 3
Leaves mostly exceeding 2 mm. 4
3. Dorsal base decurrent *brideli*
Dorsal base abrupt *oldfieldiana*
4. Leaves ovate *macrostipula*
Leaves rotund 5
5. Underleaves entire *austrigena*
Underleaves rotund to oblong, shortly
bifid with broad lobes *cordifolia*
Underleaves 1-3rd bifid, lobes
acute *planiuscula*
Underleaves absent *paucistipula*
6. Leaves 1-1.5 mm., broadly ovate 7
Leaves exceeding 2 mm. 8
7. Underleaves oblong, ventral base of
leaf not much expanded *submarginata*
Underleaf nearly reniform, lobes
dentate, ventral margin of leaf
ampliate at base *variabilis*
8. Leaves broader than long, often with
marginal teeth, cells 15-18 μ *spongiosa*
Leaves not broader than long, margin
entire, cells 36-45 μ 9
9. Leaves plane brownish *pallide-virens*
Leaves suberect, pale to dark
green *longistipula*

Group D. Apex of all or most leaves with two
teeth or lobes, otherwise plain.

1. Leaves mostly 1 mm. or under 2
Leaves 1.5 mm. or longer 5
2. Underleaves 4-fid, lower leaf-margin
straight *erectifolia*
Underleaves 2-fid, leaf-margins curved
below 3
3. Leaf rigid, 0.6 mm. *amplectens*
Leaf mostly 1 mm., flaccid 4
4. Leaf symmetric, lobes acute *lenta*
Leaf asymmetric, lobes of some
leaves obtuse *macroloba*
5. Both margins nearly straight 6
At least ventral margin curved 8
6. Lobes minute, underleaves bifid *allodonta*
Lobes larger, underleaves 4-6-fid 7

7. Cells 27-43 μ , perianth angled ... *biciliata*
Cells 18 μ , perianth winged ... *trialata*
8. Underleaf bifid, with small or no
marginal lobes ... 9
Underleaf with acute marginal lobes ... 12
9. Underleaves much broader than the
stem ... 10
Underleaves about as broad as the
stem ... 11
10. Underleaves 1-3rd bifid ... *macrostipula*
Underleaves deeply bifid ... *argentea*
11. Margins equally curved ... *austro-alpina*
Ventral more curved than dorsal
margin ... *decolorata*
12. Margins nearly equally curved ... *bidentata*
Ventral broader than dorsal margin ... 13
13. Underleaves about as broad as the
stem ... *bispinosa*
Underleaves twice as broad ... *mooreana*

Group E. Margins of leaves armed with many spines, surface papillate.

1. Leaves triangular broadly connate
with underleaves ... *leucophylla*
Leaves ovate or bifid; underleaves
nearly free ... 2
2. Leaves mostly ovate-triangular, 2 mm.
long ... *fissistipula*
Leaves 1-3rd bilobed under 1 mm. ... *muricata*

Lophocolca angulistipula, St.—Small, rigid. Leaves erect, rotund, entire, about 0.6 mm.; trigones very large, walls subnodulose. Underleaves rectangular to rotund, apex broadly truncate with a short lobe at each angle tipped with a single large cell, sinus broad, nearly straight, margin generally with a single small tooth. Perianth long exerted pyriform, triquetrous above, mouth narrow 3-lobed.

Mt. Wellington.

Lophocolca excipulata, St.—Rigid, brown. Leaves at first erect then spreading, rotund entire, base broad but not decurrent, mostly opposite, 1.5-2 mm., trigones rather large. Underleaves very small, broadly connate on both sides, bifid to the middle, lobes acute, with a similar tooth on each margin. Perianth broadly cylindric, mouth armed with short broad irregular teeth, terminal but often appearing dorsal through the extension of a single ventral innovation.

Form. minor.—Leaves under 1 mm., rigid alternate, trigones small.

Form. humilior.—Flaccid green, leaves alternate, the dorsal base decurrent, apex generally retuse, trigones none. Very common on mountains.

Lophocollea dargonia (G.), *St.*—Small, green. Leaves alternate, rotund, often retuse, erect, 0.7-1 mm., entire, base broad, trigones small, acute. Underleaves small, free, little broader than the stem to $\frac{3}{4}$ bifid, lobes acute, shortly unidentate on each margin or plain. Perianth rather large, cylindric below, triquetrous above.

Mt. Wellington. King River. Launceston.
Eastern Australia.

Lophocollea novae-zelandiae, *Nees.*—Small, much branched, yellow, rather rigid. Leaves rotund to retuse from a narrow base, erect, mostly under 1 mm., dorsal base abruptly inserted, ventral rotund, cell-walls thin, trigones small, concave. Underleaves free, oblong, nearly as long as the leaf, base narrow, apex 1-3rd bifid, lobes acute, incurved, sinus lunate. Perianth short cylindric, strongly triquetrous above.

Adamson Peak.
New Zealand.

Lophocollea tumida, *St.*—Robust, flaccid, brown. Leaves crowded, erect, rotund from a broad base, 2 mm., margins incurved, dorsal base slightly decurrent, ventral rotund, trigones large confluent. Underleaves large, sub-cucullate, free, margin regularly remotely toothed.

The above is from Stephani's Spec. Hep.
See *Chiloscyphus cordifolius*, *Rod.*

Mt. La Perouse.

Lophocollea heterophylloides, *Nees.*—Long, slender, closely procumbent. Leaves with a suberect base, but regularly decurved above, broadly ovate-rotund, entire or some retuse or even bidentate, 1.5 mm. long, base not broader than middle of leaf, trigones very small acute. Underleaves twice as broad as the stem, broader than long, deeply bifid, margins uni-bidentate, teeth short or long; connate on one or both sides with the leaf.

Very common.

Australia. New Zealand.

Lophocollea canaliculata (Tayl.), *St.*—Very close to and probably a form of *L. heterophylloides*. Smaller and leaves less crowded. Leaves ovate-oblong from a rather

narrow base, about 1 mm., entire or sometimes with 1-2 small teeth. Underleaves narrow, divided nearly to the base into two slender lobes, margin armed with one or two slender teeth.

Very common on ground.

New Zealand.

Lophocolea gunniana, Nees.—Medium size pale, rigid. Leaves crowded, erect with the apex slightly decurved, broadly ovate-rotund from a broad base, 1.7-2 mm., apex very obtuse, entire or with a few minute teeth, trigones small, generally convex. Underleaves hardly broader than the stem, $\frac{3}{4}$ bifid, lobes diverging slender, toothed on each side, margin 1-2 dentate. Perianth long triquetrous, angles narrowly winged.

Slopes of Mt. Wellington. Gordon River.

Lophocolea forsythiana, St.—Robust, many branched, branches about 1 cm. long. Leaves not crowded, suberect base and regularly decurved above, broadly triangular-rotund from a very broad base, apex obliquely emarginate to entire, 1.7 mm., dorsal base subdecurrent. Cells 18-24 μ ., trigones none. Underleaves broader than the stem, deeply bifid, lobes slender, margin uni-bidentate. Perianth short and broad, angles acute not winged.

Very common.

Eastern Australia.

Lophocolea gcheebii, St.—Robust, closely decumbent, elongating, simple or with few branches. Leaves strongly decurved, broadly obliquely triangular-rotund from a very broad base, 1 mm. long. 2 mm. wide, entire or undulate. Cells 27 μ ., trigones acute. Underleaves rather broader than the stem, generally deeply bifid, margin unidentate, sometimes nearly 4-fid. Perianth oblong.

Doubtfully distinct from the last.

Launceston.

Eastern Australia.

Lophocolea rupicola, St.—Robust but short, shoots seldom exceeding 3 cm. Leaves rigid, very crowded erect, with deflexed tips, obliquely ovate-rotund to reniform, 2 mm. long, 3 mm. broad, often with a slightly truncate bidentate apex, and often one or two small teeth along the margin; underleaves rather large, 2-3rd bifid, lobes acute dentate, marginal teeth long acute; bracts and bracteole large, dentate. Perianth long, mouth truncate, armed, angles with narrow dentate wings.

Mt. Wellington. Dromedary. Bischoff.

Lophocollea lauterbachii, St.—Pale, short, and branched, but sometimes on bark with very long simple shoots. Leaves obliquely rotund from a very broad base, mostly 1 mm. long, 1.7 mm. broad, crowded erect to almost flat, more or less deflexed, margin undulate with few very short teeth or sometimes with more spinous teeth, lower leaves truncate to obtusely bidentate. Underleaves broader than the stem free, deeply bifid lobes long slender, sinus broad, margin dentate.

Mt. Wellington. Mt. Field.

Lophocollea spongiosa, St.—Robust but flaccid and tender, pale. Leaves ovate to reniform, oblique, 2 mm. long, 3 mm broad at the base, crowded, slightly deflexed, much crumpled when dry, margin nude or with a few short broad teeth. Underleaves twice as broad as the stem, deeply bifid, lobes long slender, sinus not broad, margin dentate, when large lobes and lateral lobes armed with acute teeth; floral leaves very large. Perianth cylindric or obtusely triquetrous, angles not winged. Leaves are much more flaccid than those of *L. rupicola*, much larger than *L. lauterbachii*. Underleaf very different to *L. macrostipula*.

Mt. Wellington.

Lophocollea fissistipula, St.—Robust to very small, closely creeping on bark, many branched. Leaves nearly plano-distichous, strongly decurved, obliquely ovate-triangular from a broad base, apex entire or truncate, upper ones even bidentate, 2 mm. long, but branch leaves sometimes under 1 mm., margin usually irregularly dentate, sometimes in shade somewhat papillate on the surface, resembling *L. muricata*. Underleaves rather large, deeply bifid, lobes slender, marginal lobes slender, all armed with spinous teeth.

Mt. Wellington. Near Launceston.

Lophocollea variabilis, St.—Rather small, fragile and very pale. Leaves plano-distichous, variable, mostly obliquely quadrate to broadly ovate-truncate or obtusely bidentate, or one lobe very reduced, dorsal margin nearly straight with a slightly decurrent base, ventral deeply curved, about 1 mm. Underleaves as broad as the stem, deeply bifid, lobes slender diverging, margin dentate.

Very close to *L. hispidosa*, differs in smaller size and variable foliage.

Mt. Wellington.

New Zealand.

Lophocolea bridellii, Nees.—Rather small, pale, delicate. Leaves nearly plano-distichous, obliquely quadrate from a broad base, 1-1.3 mm. long, apex truncate-rotund to retuse, dorsal base decurrent, ventral margin slightly expanded. Underleaves free, rectangular, apex broadly truncate or shortly bilobed, sinus very broad and shallow, margin plain or with a minute tooth.

Mt. Wellington.

Eastern Australia.

Lophocolea submarginata, Tayl.—Short with many short branches. Leaves crowded, upper ones erect, lower ones plane, ovate. 1.3 mm., apex rotund, retuse or shortly bidentate. Underleaves little broader than the stem, bifid, lobes acute, margin unidentate or plain. Floral leaves dentate. Perianth strongly 3 angled, not winged.

Leaves more symmetric than in *L. bridellii* and a different underleaf.

Mt. Wellington.

Lophocolea oldfieldiana, St.—Medium size, pale dull green. Leaves when moist regularly decurved, when dry crumpled, ovate to nearly rotund from a very broad base, 1.5 mm., apex rotund or slightly emarginate, insertion of both margins abrupt, underleaves twice as broad as the stem, broadly connate on one side, $\frac{1}{2}$ bilobed, lobes broad with acute apex, usually one margin unidentate.

Mt. Wellington.

Lophocolea macrostipula, St.—Robust, pale yellow freely branched, forming dense mats. Leaves erect obliquely ovate-rotund from a very broad base, apex bidentate or retuse, or on some shoots quite entire, 1.2-2 mm. long. Underleaves broader than the stem, oblong-rectangular, upper ones very large, sinus obtuse, 1-3rd bifid, lobes lanceolate, margin entire or with one small tooth.

Mt. Wellington.

Lophocolea austrigena, Tayl.—Shoots mostly 3 cm. long. Leaves closely imbricate, rotund or rather broader than long. 1.8 mm. diameter, undulate-concave, insertion narrow, cells 27 μ , trigones small, concave; underleaves similar to the leaves, $\frac{3}{4}$ as large, entire, sinuately inserted free, in the upper portion of the shoot more oblong, and apex emarginate. Perianth broadly cylindric, strongly triquetrous, angles not winged or very minutely so, mouth broad.

Length of shoot and size of leaf variable.

Adamson Peak.

Fuegia. Falkland Is.

Form. bifida.—Leaves with a very narrow subdecurrent insertion as in the type, but the underleaves all shortly bifid with an obtuse sinus.

Cradle Mt.

Lophocolea cordifolia, *St.*—Shoots 3-6 cm. Leaves closely imbricate, ovate to rotund, 2-3 mm long, entire, insertion broad, one or both sides generally cordate, cells 27 μ ., trigones small, concave; underleaves $\frac{3}{4}$ size of leaves, upper ones oblong, lower ones subrotund, apex shortly bifid, sinus very broad, margin entire or armed with few small teeth, base sinuate free. Perianth as in *L. austrigena*.

Forms connect with *L. austrigena*.

Mt. Hartz. Adamson Peak. Cradle Mt., Etc.

Form. disticha.—Leaves more plano-distichous than erect, apex decurved.

Approaching *L. macrostipula*.

Cradle Mt.

Lophocolea paucistipula, *Rod.*—Robust, simple or with few vague branches, 2-4 cm. Leaves crowded, imbricate, rotund 1.3 mm., margin entire, dorsal base subdecurrent, ventral ampliate; marginal cells 20 μ ., trigones small, intermediate cells 35 μ ., trigones small, basals 60 x 25 μ ., trigones none; underleaves absent except in the region of reproduction, sometimes only a narrow dentate bracteole present, at others 2-3 large oblong stipules with recurved margins very like those of *L. austrigena*, and below these 2-3 reduced to vanishing spines. Bracts oblong, twice as long as leaves, often with a filiform process near the ventral base, bracteole narrow oblong, shortly bidentate, margin often dentate; perianth narrow campanulate $\frac{1}{2}$ exserted, trigonous, median keel dorsal, mouth broad with 3 broad unarmed lobes.

Allied to *L. austrigena* and *L. cordifolia*.

Bank of Creek near Cradle Mt.

Lophocolea planiuscula, *Tayl.*—Medium sized, tender, flaccid, livid-green. Leaves alternate, rotund from a slightly constricted base, middle ones about 2 mm., smaller below, larger above, erect, entire, no trigones. Underleaves rather large, free, 1-3rd bifid, lobes acute, margin unidentate.

St. Mary's.

Auckland Islands.

Lophocola longistipula, St.—Robust, pale often brownish. Leaves rather rigid to flaccid, erect in the younger plane in older parts, quadrate rotund to ovate-ligulate, 2-2.5 mm. long, apex retuse to obtusely bidentate, dorsal margin substrict shortly decurrent, ventral more strongly arcuate; cells 36-50 μ ., hexagonal, trigones in some specimens rather large, in others small, walls thin. Underleaves free, narrower than the stem, longer than broad, 2-3rd bifid, margin dentate.

Form. atro-virida. Very flaccid; dark green.

Mt. Wellington.

Lophocola pallide-virens (Tayl.), St.—Robust, rather rigid, pale green to brownish. Leaves plano-distichous, ovate, 3 mm. long, apex rotund, retuse, or bidentate with short, acute unequal lobes; cells 36 μ ., trigones small acute. Underleaves little broader than the stem, connate on one side, deeply bifid, sinus broad, lobes lanceolate diverging. Perianth terminating a short lateral branch, oblong-triquetrous, mouth 3-lobed, lobes rotund armed with long laciniae.

Mt. Wellington. West Coast.

South America.

Lophocola amplexens, Mitt.—Very small, generally under 1 cm. long. Leaves ascending, concave, broadly ovate, base broad apex, 1-3rd bifid, seldom exceeding 0.6 mm., lobes broadly lanceolate, subacute, sinus broad, cells rotund 15-20 μ ., trigones rather small, acute. Underleaves narrow, connate on both sides 2-3rd bifid, lobes slender acute, erect or spreading, margin with one small tooth. Perianth short, cylindric, very slightly angled, mouth with 3 short dentate lobes.

Mt. Wellington.

Lophocola allodonta, Tayl.—Medium size, pale. Leaves plano-distichous, flat, alternate and not crowded, obliquely quadrate to ligulate, 2 mm. long, apex with two very small acute lobes at the angles but sometimes one or both lobes absent; cells 30-36 μ ., trigones minute. Underleaves very small, not broader than the stem, deeply bifid, lobes slender, erect, margin with one basal spine.

Mt. Wellington.

Auckland Islands.

Lophocola erectifolia, St.—Medium size, pale. Leaves opposite, crowded, erect then somewhat decurved, broadly ovate-triangular hardly longer than broad, margins nearly straight, apex to 1-3rd emarginato-bilobed, sinus nearly

straight, lobes triangular acute, unequal, anterior commonly the larger; cells 27 μ ., trigones nodulose. Underleaves twice as broad as the stem, reniform, broadly connate on each side, armed with 4 spinous teeth. Bracts large, perianth partially immersed, oblong, strongly triquetrous, angles with dentate wings.

Very close to *L. trialata*, G.

Mt. Wellington.

New Zealand.

Lophocolea biciliata, Tayl.—Robust, pale. Leaves opposite, crowded, erect towards the apex, plane when mature; broadly triangular-truncate with slightly curved margins, 2 mm. long or shorter in starved plants, apex with 2 short acute diverging lobes, generally 4-5 cells broad at the base 8-9 cells long, sinus broad straight; cells 27-43 μ ., trigones none. Underleaves rotund, broader than the stem, base deeply sinuate, broadly connate on both sides, margin usually with 6 acute spines and no apical fissure.

Near *L. trialata*, but lobes smaller and margins more curved.

Mt. Wellington. West Coast.

New Zealand.

Lophocolea trialata, G.—Medium size, pale. Leaves rather rigid, opposite, crowded, plano-distichous with a tendency to decurve, broadly triangular-truncate, 1.5 mm., apex with two short or long acute diverging lobes, sinus straight, margins straight; cells 18 μ ., walls thick, trigones minute acute. Underleaves rotund with a sinuous base, broadly connate on both sides, 4-8 spined sometimes with an apical fissure. Perianth narrow-oblong, 5 mm., strongly triquetrous, angles extended into narrow dentate wings.

Very common.

Australia. New Zealand.

Lophocolea macroloba, St.—Rather small, seldom exceeding 1 cm., pale. Leaves erect then plane, nearly symmetric, subrectangular-truncate, 1 mm., bidentate lobes bold, broad obtuse, sometimes acute, erect, sinus narrow and deep, margins equally curved, insertion abrupt; cells 27 μ ., walls thin, trigones minute. Underleaves as broad or rather broader than the stem, deeply bifid, lobes erect acute, margin with one small tooth. Perianth campanulate triquetrous, mouth broad.

Close to *L. lenta*.

Mt. Wellington.

Lophocollea argentea, St.—Small, pale yellow, branches short. Lower leaves small, middle ones about 1 mm. Upper ones 2 mm., crowded, erect, ovate from a rather narrow base, apex truncate strongly bidentate, lobes erect, sinus narrow deep, margins curved, insertion abrupt. Underleaves broader than stem, deeply bifid, margins unidentate.

Very near *L. bispinosa*, but with a different habit and narrower leaf-base.

Mt. Wellington.

Lophocollea lenta, Tayl.—Slender, pale. Leaves alternate, spreading, broadly ovate nearly symmetric, 1-1.5 mm., but sometimes very small, margins curved, apex bidentate, sinus narrow; cells 27-36 μ ., trigones none. Underleaves twice as broad as the stem, shortly connate, bifid nearly to the base, lobes slender, margins unidentate, sometimes more armed. Perianth long cylindric, strongly triquetrous.

Very common.

New Zealand. Australia. South America.

Lophocollea bidentata (L.), Dum.—Robust, pale, flaccid. Leaves spreading ovate, 1-3rd bilobed, nearly symmetric, 1.5-2 mm., dorsal margin slightly decurrent, ventral abrupt, lobes long, very slender; cells 38-40 μ ., walls slender, trigones minute. Underleaves 1-3rd as large as leaves free, 2-3rd bifid, lobes slender, margin 1-2 dentate. Perianth narrow-oblong strongly triquetrous.

Common.

Cosmopolitan.

Lophocollea bispinosa, Tayl.—Slender, closely creeping. Leaves plane when mature, narrowly to broadly ovate-truncate, 2 mm., shortly bilobed, sinus broad, lunate, lobes from a broad base acute, ventral lobe or both sometimes wanting, dorsal margin nearly straight, ventral strongly curved below; cells 27 μ ., walls thin, trigones none. Underleaves little broader than the stem, free or shortly connate, deeply bifid, margin unidentate, sometimes more armed.

Mt. Wellington.

Campbell Islands.

Lophocollea austro-alpina, St.—Medium pale. Leaves more erect than plane, obliquely triangular, 1.4-2 mm., apex truncate, bidentate, base 2 mm., broad lobes short, slender diverging, both margins curved; cells 20 μ ., trigones none. Underleaves hardly broader than the stem,

$\frac{1}{2}$ bifid, lobes slender, margins unidentate. Perianth cylindric, strongly triquetrous.

Mt. Wellington.

Lophocollea decolorata, St.—Rather robust, pale. Leaves crowded, erect then more plane in older parts, obliquely ovate from a very broad base, truncate with a narrow bidentate apex, 1-2 mm., dorsal margin curved, ventral strongly curved below, lobes broad or narrow erect or spreading, sinus deep. Cell-walls rather thick. Underleaves hardly broader than the stem, very deeply bifid, lobes slender, margin unidentate. Inner floral leaves little larger, ovate, apex deeply bifid, lobes narrow long attenuated.

Very close to *L. hispinosa* and *L. austro-alpina*.

Mt. Bischoff.

Lophocollea mooreana, St.—Robust, pale. Leaves ovate from a broad base, 2-5 long and wide, apex truncate boldly bispinous, lobes broad at the base, acute, sinus deep, dorsal margin nearly straight, shortly decurrent, ventral strongly curved below; cell walls thin. Underleaves twice as broad as the stem, deeply bifid, lobes acute, margin with one bold spine. Inner floral leaves 4 mm. long, oblong-elliptic, apex bifid, lobes triangular, attenuated.

Doubtfully distinct.

St. Patrick's Head.

Lophocollea leucophylla, Tayl.—Pale green or yellow, much branched and rather rigid. Leaves crowded, concave, distichous, triangular from a broad base, 1-2 mm. long, dorsal base decurrent, apex narrow boldly bispinous, margin armed with few or many bold unequal spines. Cells 18-27 μ ., trigones small rotund, each cell with one convex papilla, but sometimes reduced to a mere convexity. Underleaves rather large and broadly connate on both sides, reniform, margin armed with about 6 bold spines. Perianth long exserted, large, usually acutely triquetrous, but in some specimens even in the same mass narrowly fusiform.

L. verrucosa, St., appears not distinct.

Common, chiefly on mountains.

Lophocollea muricata, Nees.—Very small. Leaves plane, about 1 mm., ovate-triangular to 1-3rd bifid, lobes broad, sinus narrow, margin armed with a few spines. Cells 18 μ ., surface armed with prominent papillae. Underleaves deeply bifid, each margin with a spinous lobe, all lobes acutely dentate. Perianth oblong, triquetrous, mouth copiously armed, surface setulose.

Common throughout the Southern Hemisphere.

CHILOSCYPHUS, CORDA.

Plants from very robust to very small. Stems simple or with few irregular lateral branches. Leaves succubous, opposite or alternate entire or with a dentate margin seldom bilobed. Cells medium sized; trigones from very large to none. Underleaves well developed, bifid with acute lobes to reniform. Sporophyte terminating a very short branch placed low down on the stem. Calyptra well developed. Perianth oblong to campanulate cylindric, mouth generally lobed, not constricted.

The genus is indistinguishable from *Lophocollea* except in the position of the sporophyte.

1. Underleaves reniform 2
Underleaves not broader than long 8
2. Leaves entire or with few very small teeth 3
Margins of leaves and underleaves dentate... 4
3. Dorsal bases connate, cuticle
smooth *conjugatus*
Dorsal bases free, cuticle papillate ... *kirkii*
Leaves undulate *sinuosus*
Leaves and underleaves with saccate
appendages *cymbaliferus*
4. Underleaves with short simple teeth 5
Underleaves with 4 bifid lobes and spinous
teeth 7
5. Trigones large confluent *billardieri*
Trigones small 6
6. Underleaf concave; cells 30 μ *gunnianus*
Underleaf flat; cells 40-50 μ *tasmanicus*
7. Leaf apex bi-tridentate *fissistipus*
Leaf pluridentate *multifidus*
8. Dorsal base of leaf abrupt 9
Dorsal base decurrent 13
9. Underleaf rotund, entire or shortly bifid ... 10
Underleaf oblong, deeply bifid 12
10. Underleaf broadly connate with the
leaves *levieri*
Underleaves free or nearly so 11
11. Trigones small acute *weymouthianus*
Trigones large confluent *cordifolius*
12. Leaves smooth, cells large *larus*
Leaves spinous and papillose *echinellus*
13. Leaves with a truncate bifid apex 14
Leaves entire or irregularly bi-tridentate ... 15
14. Underleaf rotund 3-4 times as broad
as the stem *coalitus*
Underleaf oblong, not broader than
the stem *filicicolus*

15. Leaf entire rarely a few bifid *limosus*
Leaf with 3 short oblique lobes *tridentatus*

Chiloscyphus conjugatus, Mitt.—Very robust and often 10 cm. long. Leaves opposite crowded imbricate erect, broadly ovate-triangular from a broad base, 3 mm. long, dorsal bases united across the stem, margin entire dorsally substrict, reflexed, ventral margin more curved, shortly united to the underleaf; cells 36-44 μ .; trigones large and very convex. Underleaves reniform concave, 1.5 mm. long, twice as broad, margin entire or armed with few very small teeth.

Mt. Wellington. Adamson Peak. Zeehan. Cradle Mt., Etc.

Form. dentatus (*Ch. moorei*, St.).—Leaf margin usually bearing a few small teeth. Margin of underleaf more distinctly armed. Not consistently distinct from type.

Common in forests.

Chiloscyphus kirkii, St.—Pale green to yellow, mostly 3-4 cm. long. Leaves plane in damp localities, more erect in dry ones, crowded, closely imbricate ovate obtuse, 1.5-2 mm. long, alternate, dorsal base expanded into a dentate appendage, margin otherwise entire or with a few small serrations; cells 28-32 μ ., trigones huge and confluent, cuticle papillose. Underleaf reniform nearly as broad as the leaf, very short closely imbricate, margin entire or armed with minute teeth, slightly united with the leaves.

Adamson Peak. Mt. Field.

New Zealand.

Chiloscyphus billardieri (Schw.), Nees.—Robust, rather rigid, brownish. Leaves opposite crowded, erect, asymmetric, broadly ovate-triangular from a broad base, 2 mm., dorsal margin substrict and combining at the base with the opposite leaf, margin variously armed with spinous teeth usually two conspicuous ones at apex; cells 20-30 μ .; trigones very large confluent. Underleaves broadly reniform, not very concave, more or less armed with short spinous teeth.

Mt. Wellington. Adamson Peak. West Coast.

Form. integrifolia.—Leaf and underleaf margin entire or with very small teeth. Resembling *Ch. conjugatus*, Mitt., only of much smaller size.

Mt. Hartz. Adamson Peak.

Form. ciliatus (*Ch. ciliatus*, *St.*).—Armature of leaves and underleaves of longer spines.

West Coast.

New Zealand.

Chiloscyphus gunnianus, *Mitt.*.—Flaccid, livid green to brownish. Leaves opposite, broadly ovate from a broad base, 2-2.5 mm. long, dorsal bases uniting, margin armed with few or many spinous teeth; cells 30 μ , walls thin; trigones from none to small. Underleaves broadly reniform, armed on the margin with few small spinous teeth.

Differs from *Ch. billardieri* only in the more tender substance of the leaf. The development of trigones very variable. Probably only a shade form of the last.

Recherche. West Coast. Trowutta.

Chiloscyphus tasmanicus, *St.*.—Medium size, seldom exceeding 2 cm., pale green and of delicate consistence. Leaves opposite ovate-rectangular to ovate from a broad base, plane in damp situations, otherwise erect, 2 mm. long, dorsal bases shortly joined, margin armed all round with slender spines; cells 35-50 μ ; trigones small concave. Underleaf reniform flat, 2 mm. wide, armed with about 12 spines.

Armature more pronounced than in *Ch. gunnianus*. Underleaf relatively larger, cells larger.

West Coast.

Chiloscyphus fissistipus, *Tayl.*.—Robust, 2-3 cm. long. Leaves asymmetric, opposite, plane, oblong, 2.5 mm., dorsal margin substrict, the base decurrent, free or slightly connate with opposite leaf, apex bi or more often tridentate, rarely pluridentate, ventral margin strongly curved; cells mostly 25-35 μ , walls rather strong, trigones small concave. Underleaf reniform, 2 mm. broad, apex usually with a deep median sinus, margin armed with many long spinous teeth.

Mt. Wellington. Mt. Dromedary. Cradle Mt., Etc.
East Australia. Auckland Islands.

Form. integrifolius.—Leaves broadly ovate entire or with one or two apical teeth. Underleaf broadly reniform armed with long and short spines, often more or less lobed as in *Ch. multifidus*.

Mt. Wellington.

Chiloscyphus multifidus, *St.*.—Very similar to and possibly a robust form of the last. Leaves broadly ovate-triangular subsymmetric, 3 mm., dorsal base free decur-

rent, ventral margin more curved armed with few bold teeth, apex truncate rotund armed with 2-4 bold spines; cells 36 μ ., trigones small or none. Underleaf large reniform very broad, with 6-8 shallow lobes armed with bold spines, lower underleaves small and simpler.

Blue Tier. Mt. Field.

Chiloscyphus cordifolius, Rod.—Robust, 4-6 cm. long, densely pulvinate, rigid, yellow. Leaves erecto-homomalous, closely imbricate, alternate, rotund, 1 mm. long, rather broader than long, both bases cordate and free, margin entire, cells towards the margin 16 μ ., lower ones 33 μ ., trigones as large as the cells confluent, surface smooth. Underleaves rotund, concave, imbricate, free, 0.7 mm. long, margin entire or with about 6 obtuse angles. No perianths present, but a group of archegonia terminating the shoot, thus bearing the character of *Lophocolea*, but habit and leaf structure is typically of *Chiloscyphus*. Possibly it is this plant that Stephani describes as *Lophocolea tumida*.

Adamson Peak.

Chiloscyphus sinuosus (Hook.), Nees.—Robust, often 5 cm. long. Leaves opposite crowded, plane to erect, broadly triangular, 3 mm. long, dorsal base free, very decurrent or slightly connate with opposite leaf, margin substrict undulate, apex rather acute, ventral margin broadly curved undulate entire; cells 27 μ ., trigones large convex. Underleaves very broadly connate with the leaves, short, broadly reniform armed with many irregular spines.

Mt. Wellington. Mt. Hartz.

New Zealand. Auckland Islands.

Chiloscyphus cymbaliferus (Hook.), Nees.—Medium size generally about 4 cm. long. Leaves opposite densely crowded erect imbricate, giving the shoot a terete appearance, subrotund, asymmetric, about 1 mm. long, dorsal base rotund shortly joined to the opposite leaf, apex obtuse often with a few short obtuse teeth, ventral margin bearing a saccate appendage; cells about 30 μ ., trigones large often confluent. Underleaves short very broad, apex shortly dentate, each margin bearing a large saccate appendage.

Common on mountains.

New Zealand. Auckland Islands.

Form. submersa.—Leaves larger, less erect, ovate-rotund, appendage very reduced. Underleaves rotund entire with reduced appendages.

In wet ground. Adamson Peak.

Chiloscyphus levieri, St.—Closely creeping on bark, about 3 cm. long. Leaves opposite crowded, suberect broadly ovate-triangular about 2.5 mm., dorsal base abrupt meeting or joining with the opposite leaf, margin nude or with a few teeth above, apex and ventral margin armed with slender spines; cells 30-36 μ ., trigones large rotund. Underleaves orbicular about 2 mm. diameter, broadly joined to the leaves, armed with about 8 slender spines.

West Coast.

Chiloscyphus coalitus (Hook.), Dum.—Robust, often 10 cm. long, closely decumbent dark green. Leaves not crowded opposite or alternate, plane ovate-triangular, truncate with two acute apical teeth or the upper leaves more or less entire, 3 mm. long, dorsal margin strict base decurrent free or joining with the opposite leaf, ventral margin strict base connate with the underleaf; cells irregular in size, mostly 30 μ ., walls rather thick, trigones minute or none. Underleaves small, 2-3 times as broad as the stem, subrotund truncate, sinus broad margin armed with 1-4 slender teeth.

Very common.

East Australia. New Zealand. Auckland Islands.

Chiloscyphus tridentatus, Mitt.—Small and slender generally 1-3 cm., dark green. Leaves alternate with a nearly vertical insertion plane, ovate-rectangular 1 mm., apex with three short unequal lobes, dorsal base free very shortly decurrent, ventral base very shortly connate with the underleaf; cells mostly 20×27 μ ., trigones none. Underleaves small, as broad as the stem bifid to below the middle, lobes slender, each margin with one bold slender tooth.

Common in shade on banks.

Chiloscyphus filicicolus, St.—Stems decumbent, 1-2 cm. long. Leaves alternate plane ovate-rectangular 2 mm., dorsal margin strict base decurrent free, apex abruptly truncate, a filiform tooth arising from each angle, ventral margin strict, very shortly connate with the underleaf; cells 30-40 μ ., walls thick, trigones none; underleaf oblong not broader than the stem, deeply bifid, lobes acute, margin unidentate, sometimes unarmed or bidentate.

Very close to *Ch. coalitus*, differing mainly in size and smaller underleaf. Doubtful species.

On fern-stem, East Coast.

New Zealand.

Chiloscyphus weymouthianus, St.—Medium size, but seldom exceeding 2 cm., freely branched. Leaves opposite plane to suberect, broadly ovate from a broad base 1.5-2.5

mm., dorsal base rounded and shortly connate with the opposite leaf to free and decurrent, margin entire or with 1-2 small apical teeth to armed with 10-12 short teeth; cells 18-30 μ ., trigones very small concave; underleaf broadly oblong to subrotund little broader than the stem, apex with 2 slender lobes, margin usually 1-2 dentate.

West Coast.

Chiloscyphus limosus, C. et P.—Very variable in size and some details, often up to 10 cm., but sometimes small, dark green. Leaves alternate plane, broadly ovate obtuse or rarely with 1-2 apical teeth 2-3 mm., dorsal base free shortly decurrent, ventral base shortly connate with the underleaf; cells 25-35 μ ., trigones small, concave rarely convex; underleaf rotundo-quadrate 2-3 times as broad as the stem, equally quadrifid or rather bifid with 1-2 marginal teeth rarely very small and shortly bifid.

Very common on banks of streams.

Australia.

Chiloscyphus lacus, Mitt.—Small and delicate, usually about 2 cm. long. Leaves alternate plane with a nearly vertical insertion ovate-triangular 1-1.5 mm., very thin texture, usually irregularly trilobed, sometimes quadrilobed, lobes short broad acute, dorsal base free not decurrent, ventral base shortly connate with the underleaf; cells irregular mostly 40-50 μ ., walls equally thickened, cuticle thin, trigones none. Underleaf rather broader than the stem, deeply bifid, lobes slender, margins often unispinous.

In shade the ultimate branches often very attenuated, and the leaves reduced to subulate processes, 5 cells long and 1 cell diameter. Also described in Stephani's Sp. Hep. as *Lophocollea weymouthiana*.

Common in damp shade.

New Zealand.

Chiloscyphus echinellus (L. et G.), Mitt.—Small and slender, under 2 cm., stem covered with prominent papillae. Leaves alternate plane broadly ovate, 0.7-1 mm., margin armed with unequal spines, dorsal base free, ventral shortly connate with the underleaf, surface covered with acute papillae; cells 16 μ ., walls thick, trigones none; underleaves oblong twice as broad as the stem, lobes slender armed with spines, margin similarly armed.

Very like *Lophocollea muricata*, only leaves not bifid. Perianth on a short basal branch, and cylindric not trigonous as in that plant.

Common in damp forests.

New Zealand.

LEPTOSCYPHUS, MITT.

Simple or sparingly branched; decumbent with numerous rhizoids on the ventral surface. Leaves succubous, entire, rotund, rarely bilobed or ovate. Underleaves present, entire or bifid, margins sometimes armed. Perianth terminal, often appearing lateral from the growth of subfloral branches, inflated below, laterally compressed above the mouth truncate and bilabiate, entire or denticulate.

Mitten subsequently changed the name to *Leioscyphus*. This is still maintained by Stephani.

Leptoscyphus chiloscyphoides (Lindb.).—Stems usually 2-3 cm. long. Leaves rotund or quadrate-rotund, erect, opposite, 2 mm., base not constricted; cells about 36 μ ., walls medium, trigones small concave or none; underleaves small, connate on both sides, deeply bifid lobes acute, margins unidentate. Bracts similar to the leaves but larger; perianth 3-4 mm., immersed in the leaves, very flat above with two broad entire lips.

Very like *Lophocolea novae-zelandiae*, but the larger cells and very different perianth distinguish it.

Mt. Wellington. Western Tiers.

ODONTOSCHISMA, DUM.

Robust, simple or with few branches, decumbent to suberect. Leaves succubous, erect, crowded, rotund, entire. Underleaves oblong and well developed to obsolete. Perianth terminal, short and broad, obscurely 3-angled; bracts bi-trifid.

Very near *Jamesoniella*, but the bracts not fimbriate, the mouth not as contracted nor plicate, and underleaves present.

Odontoschisma marginata (Mitt.), St.—Stems slender, elongating often to 10 cm., dark green. Leaves rotund erect crowded, 1-2 mm., margin with a narrow thick edge; cells mostly 36 μ ., walls slightly thickened; underleaves often nearly as long as the leaves, ovate, free with a shortly bifid apex. Bracts little enlarged, entire; perianth broadly campanulate, shorter to longer than the leaves, one dorsal and two ventral shallow keels, mouth broad, erose.

Mt. Wellington. Mt. Field. Cradle Mt., Etc.

CEPHALOZIA, DUM.

Small, simple or with few branches, the branches usually arising from the ventral surface. Leaves succubous

to nearly transverse, bilobed. Underleaves none or rudimentary except in the region of reproductive organs. Fruit terminal or on short lateral branches, bracts large, bracteole free or united to the bracts; perianth tapering to a constricted dentate mouth, trigonous, the third angle ventral.

Leaf margin entire or nearly so.

Underleaves absent.

Pale green leaves appressed *bastovii*

Livid green leaves spreading *levieri*

Black, long wiry *aterrima*

Underleaves present small.

Leaves red remote spreading *exiliflora*

Leaves brown erect imbricate *preissiana*

Margin dentate.

Marginal teeth few simple *verrucosa*

Marginal teeth many acute *squarrosula*

Marginal teeth compound *hirta*

Cephalozia bastovii, *C. et P.*—Pale glaucous green, usually with many lateral as well as ventral branches, sometimes simple, about 1 cm. long, rather bare below, copiously leaved above. Leaves appressed rather imbricate, ovate stem clasping below, apex 1-3rd bifid, lobes broad below, acute, sinus acute, 0.4 mm. long; cells variable in size, mostly 12-15 μ , walls thick. Underleaves none.

Mt. Wellington Plateau.

Cephalozia exiliflora (Tayl.), Spr.—Dark red-brown in dense mats, usually on burnt wood, stems about 5 mm., simple or branched. Leaves remote, patent, transverse, broadly oblong 0.3 mm., 2-3rd bifid, sinus very broad, lobes acute; cells 12 μ , walls thick. Underleaves minute entire or bifid. Perianth terminal oblong, 3-5 plicate, 1 mm. long, dark red below, hyaline above, mouth crenulate.

Very common.

Australia. New Zealand.

Cephalozia preissiana (Lehm.), St.—Very small, brown, amongst small plants on logs. Leaves suberect, imbricate, 0.1-0.2 mm. long, broadly oblong bifid to the middle, sinus rather acute, lobes very broad, apex acute; cells 10 μ ; underleaves similar to the leaves only smaller.

On wood. West Coast. Trowutta.

Cephalozia levieri, St.—Small, the shoots seldom exceeding 5 mm., usually simple pale livid green. Leaves spreading obtusely conduplicate transverse, 0.2 mm.,

2-3rd bifid, sinus acute, lobes broad, apex acute; cells irregular mostly $10 \times 15 \mu$, walls thick; underleaves absent. Perianth long narrow linear, triplicate above, mouth narrow.

West Coast.

Cephalozia verrucosa, St.—Small, the shoots usually simple and under 5 mm. long, more or less red-brown. Leaves spreading broadly oblong transverse conduplicate 0.1 mm., to $\frac{1}{2}$ bifid, lobes ovate obtuse or acute, margin often with a few prominent teeth; cells 12-15 μ , walls thick, dorsal cuticle verrucose; underleaves small bifid. Perianth large oblong to fusiform, acute trigonous, dark below, hyaline above.

West Coast. Trowutta.

Fuegia.

Cephalozia aterrima, St.—Black in tangled masses on rocks in pools and streams, stems very slender and long wiry devoid of leaves except towards the ends. Leaves transverse closely appressed cordate, 0.2 mm. long, shortly bifid, lobes broad obtuse; cells 12-18 μ , walls dark rather thin; underleaves absent. Perianth terminal narrow oblong strongly triplicate, 1.2 mm., mouth contracted.

Mt. Wellington. Western Tiers. Cradle Mt., Etc.

At a considerable altitude.

Cephalozia squarrosula (Tayl.), St. (*Jung. divaricata*, Mitt.).—Very small, pale green stems under 5 mm. Leaves patent, nearly rotund, conduplicate, transverse 0.1 mm. long, $\frac{1}{2}$ bilobed, lobes broadly triangular acute, margin regularly denticulate; cells 15 μ , walls thick; underleaves similar to leaves and but slightly smaller. Perianth oblong 0.7 mm., pluriplicate delicate, mouth lacerate, bracts half as long, strongly dentate.

On heath near Kingston.

W. Australia. New South Wales.

Cephalozia hirta, St. (*C. dentata*, Mitt.).—Small pallid green. Leaves remote, spreading broadly obcuneate, conduplicate, 0.1 mm., deeply bifid, lobes ovate acute, margin armed with numerous compound spinous teeth, a large spine conspicuous near the base of each margin; underleaves similar, little smaller. Perianth terminal oblong, pluriplicate delicate.

Numerous localities. On bark and fern stems.

East Australia.

ZOOPSIS, HOOK. F. ET TAYL.

Stems slender decumbent with few irregular ventral branches, a narrow central strand of elongated narrow cells surrounded by a cortex of large inflated cells. Leaves more or less rudimentary, reduced to the base or deeply bifid. Underleaves rudimentary. Fertile branch short arising from the ventral surface; perianth terminal oblong to fusiform, smooth or plicate, mouth tapering lobed.

Colour always pale watery green. The genus is most closely allied to *Lepidozia*. *Z. leitgebiana* might readily be referred to that genus.

Leaves reduced to 2 celled lobes *argentea*

Leaves rudimentary with 2 spinous lobes... *setulosa*

Leaves with 2 unequal lobes *leitgebiana*

Zoopsis argentea, Hf. et Tayl.—Shoot a flat linear frond. Leaves reduced to alternate lobes each of two inflated cells; underleaves rudimentary formed of two oblong cells and two much smaller apical ones. Bracts and bracteole small bifid: perianth narrow pyriform-cylindric, divided above to a third of its length into six lanceolate acute lobes.

Common on dead wood.

Australia. New Zealand. Indian Archipelago.

Zoopsis setulosa, Leitg.—Shoot a flat linear frond. Leaves reduced to alternate lobes of two large inflated cells, each cell tipped with a linear two-celled lobe; underleaves rudimentary of two short basal and two linear upper cells. Bracts bifid, apex setulose, bracteole similar, perianth ovate plicate, mouth deeply six lobed, lobes setulose.

Mt. Wellington. Cradle Mt. West Coast.

Zoopsis leitgebiana, C. et P.—Shoots slender. Leaves remote, unequally bifid, base 1 cell deep, 4 cells wide, dorsal lobe 3 cells in one series, ventral lobe 5 cells long, 2 cells wide at base; underleaves of 2 oblong cells, tipped each with a small cell. Bracts and bracteole 1-3rd bifid, lobes acute; perianth linear triplicate, apex shortly 6 lobed.

Kingston. West Coast.

East Australia. New Zealand.

ISOTACHIS, MITTEN.

Decumbent, stem elongating with few irregular branches. Leaves incubous to transverse, squarrose to decurvo-homomallous, conduplicate concave, asymmetric, apex usually truncato-bilobed, lobes broad short unequal, dorsal margin more expanded than the ventral, insertion

contracted. Underleaves similar to the leaves, rarely much smaller. Perianth terminal, fleshy, oblong-fusiform; foot of the sporophyte deeply sunk in the expanded shoot.

1. Leaves squarrose 2
 Leaves erect or decurved 5
2. Leaves crowded base stem clasping 3
 Leaves free base narrow 4
3. Leaves 1-1.5 mm. long *inflera*
 Leaves 2.5-3 mm. long *grandis*
4. Leaves 2 mm. Underleaves similar... *gunniana*
 Leaves 0.6 mm. Underleaves minute ... *pusilla*
5. Underleaves armed with acute
 teeth *intortifolia*
 Underleaves bifid or trifid unarmed 6
6. Leaves minute remote *attenuatus*
 Leaves crowded decurved *subtrifida*
 Leaves large black erect crowded *riparia*

Isotachis gunniana, Mitt.—Stems often 4 cm. long, reddish-brown or green. Leaves squarrose, ovate-rotund, 2 mm. long, apex shortly to 1-3rd bilobed, sinus obtuse, lobes broadly triangular, acute or obtuse, margins entire or sometimes the ventral with one or two small teeth; upper cells rectangular 21 μ , lower ones 21 x 60 μ , cuticle asperate. Underleaves nearly as long as leaves, oblong; sometimes only half as large and $\frac{1}{2}$ bifid.

Mt. Wellington. Mt. Field. Adamson Peak, Etc.

Isotachis inflera, Gott.—Stems about 4 cm. long, yellowish green often the apex reddish. Leaves imbricate to recurved from an appressed base, subrotund to broadly rectangular, 1-1.8 mm., apex shortly to 1-3rd bilobed, lobes equal, broadly triangular acute, margin usually acutely bidentate, sometimes entire; upper cells 21 μ , lower 21 x 60 μ , cuticle asperate to papillate above, striolate below. Underleaves similar to the leaves.

Very close to *I. gunniana*, distinct chiefly by smaller crowded leaves.

Longley.
 Australia.

Isotachis grandis, C. et P.—Robust, usually 7-10 cm. long, green or reddish. Leaves closely imbricate recurved, broadly ovate-rotund, 2.4 mm., 1-3rd bifid, lobes acute, sinus acute, margins armed with spinous teeth to entire; upper cells 21-35 μ , asperate, lower 21-54 μ , striolate. Underleaves similar to the leaves, sometimes rather smaller, usually less armed. Perianth cylindric, 6

mm. long, mouth shortly 3 lobed, lobes narrow acute fimbriate. Close to *I. gunniana* only more robust, leaves imbricate and generally acutely armed.

Mt. Wellington. Western Tiers.
Victoria.

Isotachis intortifolia (Tayl.), Gott.—Robust, stems to 10 cm., yellow. Leaves closely imbricate decurved towards the ventral aspect, asymmetric, the dorsal margin broader than the ventral, broadly ovate 2.5-3 mm. long, apex shortly bi-trilobed, lobes broadly triangular acute, margin with few small teeth or entire; upper cells asperate or papillate rotund 20 μ . lower striate very long. Underleaves nearly as long as the leaves, broadly oblong $\frac{1}{4}$ bilobed, lobes acute, margin armed with few acute teeth. Perianth narrow ovate 4 mm., tapering to a slender mouth.

Mt. Wellington. Mt. Hartz. Blue Tier, Etc.
Australia. Campbell Islands.

Isotachis subtrifida (Tayl.), Mitt.—Small, 2-4 cm., livid green. Leaves remote below, more imbricate above, decurved towards the ventral aspect, oblong slightly asymmetric, 1.4 mm., 1-3rd- $\frac{1}{2}$ bilobed, rarely trilobed, lobes triangular acute, sinus acute, margin entire seldom with few rudimentary teeth; upper and marginal cells 25 μ ., minutely asperate, central basal ones longer striolate. Underleaves oblong, 2-3rd as long as leaves. In some robust forms the leaves are longer and looser, more often trifid, and the underleaves as long as the leaves. Perianth broadly oblong, 4 mm., but little exceeding the bracts, mouth deeply fimbriate.

Mt. Wellington.

Isotachis pusilla, St.—Very small, under 1 cm. long, pale green. Leaves squarrose, subrotund 0.6 mm. long. 1-3rd- $\frac{1}{2}$ bifid, lobes oblong, obtuse or acute, margin plain to armed with many obtuse or acute teeth; cells mostly 20 μ ., cuticle smooth. Underleaves small, hardly broader than the stem, margin many dentate, 1-3rd bifid, lobes acute.

Longley.

Isotachis attenuatus, Rod.—Stems 1-2 cm. long, very slender, growing amongst moss in wet situations. Leaves rather remote erecto patent narrow oblong from a narrow base, dark brown, $\frac{1}{2}$ bifid, lobes lanceolate acute, 0.5 mm.; outer cells 18 μ ., inner ones 18 x 24 μ ., walls thick; underleaves similar. Bracts many, similar to the leaves but

larger. Perianth terminal, 1 mm. long, ovate strongly triquetrous, keels obtuse, mouth obtuse, shortly fimbriate.

Mt. Wellington Plateau.

Isotachis riparia, Rod.—Robust, almost black, stems 5-8 cm. Leaves erect closely imbricate broadly ovate to almost rotund, 3 mm. long, apex shortly bifid, lobes short broad subacute, margin entire or with 1-2 small teeth; upper cells 27 μ ., walls thick, lower cells 40 x 18 μ ., walls thin, cuticle smooth; underleaves to 3 mm. long, 2 mm. broad oblong, apex shortly bifid, margin entire or armed with about 3 small teeth.

Quite dissimilar to any other Tasmanian species. It is near *I. gigantea* of New Zealand.

Cradle Mt.

LEPIDOZIA, DUM.

Plants from small to medium size, pinnate or bipinnate, the branches lateral frequently with flagellate tips. Leaves incubous obliquely to subtransversely inserted, small, mostly quadrifid, rarely with fewer or more divisions, which extend usually to the middle, sometimes less deep, rarely to the base; underleaves similar to the leaves but often much smaller. Perianth terminating a short branch low down the stem, cylindric or fusiform, mouth entire or more or less fimbriate.

Section symmetricae.—Leaves symmetric.

1. Leaves 2-lobed *tasmanica*
 Leaves 3-lobed 2
 Leaves 4-lobed 4
 Leaves many lobed *mooreana*
2. Leaves divided to middle *vastiloba*
 Leaves divided to base 3
3. Leaflobes setaceous *longiscypha*
 Leaflobes moniliform *chaetophylla*
4. Leaflobes lanceolate generally incurved 4 to many celled at the base 5
 Leaflobes setaceous divergent generally 2-celled at base 8
5. Leaves subvertical, lobes widely divergent *praeinitens*
 Leaves subtransverse, lobes incurved 6
6. Cells of lobes not larger than those of disk *cucullifolia*
 Cells of lobes longer than those of disk ... 7

7. Green or yellow *appressifolia*
 Brown to black *saddlensis*
 Each margin with a short supplementary lobe *serfida*
8. Plant glaucous, small *centipes*
 Green, lobes acute spreading *capilligera*
 Dark brownish, lobes setaceous divergent *setiformis*
 Green robust lobes erect *grossiseta*

Section asymmetricae.—Leaves asymmetric, the dorsal margin much longer and more curved than the ventral.

9. Margin nude or 1-2 teeth 10
 Margin armed 15
10. Plant green or yellow 11
 Plant glaucous *glaucophylla*
11. Leaves patent concave, lobes incurved ... 12
 Leaves of main stem at least closely appressed 14
12. Margin with 1-2 short acute teeth *chordulifera*
 Margin nude 13
13. Leaves 0.3 mm. with short lobes ... *levifolia*
 Leaves 0.9 mm. divided to the middle *asymmetrica*
14. Branch leaves close patent *procera*
 All leaves closely appressed remote... *parviretexta*
15. Leaf-margin armed with cellular teeth
 or cilia *albula*
 Leaf-margin armed with simple or forked unicellular spines *appendiculata*

Lepidozia tasmanica, St.—Small, yellow-green, with many capillary branches. Leaves remote patent incurved, nearly transversely inserted oblong, 2-3rd bifid, rarely the lower ones 3-4 lobed, 0.4 mm., base 2 cells high, lobes lanceolate erect or incurved, cells rectangular, mostly 60 x 22 μ .; underleaves similar but only 1-3rd as large. Perianth narrow cylindric 2-3 mm., mouth fimbriate.

Longley. West Coast.

Lepidozia vastiloba, St.—Very small, densely caespitose, irregularly branched. Leaves obcuneate nearly transversely inserted very concave, symmetric trilobed to the middle, 0.5 mm. long, lobes incurved oblong-triangular obtuse 4 cells wide at the base; cells 27 μ .; underleaves small appressed, 2-3rd trilobed.

West Coast.

East Australia.

Lepidozia longiscypha, *Tayl.*—Small and slender, irregularly branched. Leaves nearly transverse remote, spreading trifid to the base, 0.35 mm. long, base 1 cell high and 6 broad, lobes diverging setaceous, 2 cells broad at the base, 7 cells long; underleaves similar but smaller; cells of lobes $45 \times 15 \mu$.

West Coast. East Australia.

Lepidozia chaetophylla, *Spruce.*—Small and very pale. Leaves remote transverse, bifid or trifid to the base, lobes setaceous, 0.3 mm. long, 1 cell wide, 4 cells long, rarely more; cells rather inflated $60-100 \times 30 \mu$; underleaves smaller, generally 3 cells long.

Mt. Wellington Plateau. Tasman Peninsula.
South Africa. South America.

Lepidozia praenitens, *L. et L.*—Small, branches mostly with flagellate tips. Leaves remote on stems, crowded on branches, symmetric very obliquely inserted, quadrifid to the middle, 0.4 mm. long and broad, lobes lanceolate 4-6 cells broad at the base; underleaves smaller, more deeply divided, appressed.

Variable but distinguished by the very oblique spreading symmetric leaves.

Very common.

New Zealand.

Lepidozia appressifolia, *St.*—Small and slender, pale green. Leaves obcuneate 0.4 mm. long, very concave, the lobes sharply incurved, transversely inserted, quadrifid below the middle, base rather narrow usually unidentate on the margin, lobes slender 4-5 cells broad at the base, cuticle verrucose; underleaves about the same size but more deeply divided, trifid rarely quadrifid.

Very common.

Form. armata.—Leaves crowded, 2-3rd quadrifid, lobes lanceolate acute, 4-6 cells broad at the base, base 8 cells high 16 cells broad, margin 1-2 dentate.

Intermediate between this and *L. serfida*.

Lepidozia saddlensis, *B. et Mass.*—Small and densely massed, very dark. Leaves remote below, crowded above, closely overlapping, and usually leaving a well-marked dorsal groove, concave, transverse symmetric obcuneate, 0.4 mm. long, 2-3rd quadrilobed, lobes lanceolate sometimes armed with a lateral tooth, 4 cells broad at base; cell wall thick, cuticle verrucose; underleaves similar and little

smaller. Differs from *L. appressifolia* only in colour and more compact habit.

Cradle Mt. West Coast.

Fuegia.

Lepidozia serfida, St.—Very small, not usually flagellate. Leaves symmetric transverse subrotund, 0.3 mm., suberect concave, 2-3rd sexfid, the four middle lobes lanceolate, 4 cells broad at base, lateral lobes shorter and narrower; cuticle minutely asperate; underleaves smaller with a shorter base, lobes 4 or 5. Very near *L. appressifolia*.

Common on wet, sandy heaths.

Eastern Australia.

Lepidozia cucullifolia, St.—Small, intricately branched with flagellate tips, very dark olive green. Leaves symmetric remote suberect very concave, subrotund 0.6 mm. broad and long, quadrilobed to or below the middle, lobes lanceolate, 6-10 celled at the base subacute; cells 17 μ ., only the basal ones larger; underleaves quadrate smaller deeply quadrifid. Variable in colour and often with smaller lobes.

Adamson Peak.

Lepidozia centipes, Tayl.—Small glaucous. Leaves symmetric, very obliquely inserted, remote on stem, crowded on the branches, broadly obcuneate, divided to the middle into 3-4 diverging acute lobes 0.3-0.6 mm., base about 6 cells high, lobes 4-6 cells long, 2 cells wide at the base; cells 36-50 μ ., underleaves very much smaller with a very short base and slender lobes.

Distinguished by the glaucous symmetric leaves and large cells.

Mt. Wellington. Castra. Freycinet Peninsula.
Australia.

Lepidozia capilligera, Lindb.—Small and slender with few irregular branches, generally ending with flagellate tips, green. Leaves obliquely inserted remote, quadrifid to the middle, obcuneate, symmetric mostly 0.4 mm. long, those of the branches often trifid and more crowded, cells 17-27 μ ., lobes lanceolate acute widely diverging, cells larger, 2 cells broad at the base; underleaves similar but smaller.

Variable. A small condition referred by Stephani to a separate species as *Lepidozia oldfieldiana*.

Very common.

Australia. New Zealand.

Lepidozia setiformis, De Not.—Dark brown, slender lower branches often long and flagellate. Leaves symmetric remote squarrose broadly obtuneate from a narrow subtransverse insertion, mostly 0.5 mm. long, quadrifid to or below the middle, lobes widely diverging often a short spinous tooth on the margin, base of the lobes 2-4 cells wide rapidly narrowing to a 1-celled spinous apex 4-5 cells long; cells of base 18 μ ., verrucose, those of the lobes mostly 60 x 20 μ ., minutely striate. Underleaves similar.

Mt. Wellington. West Coast.

S. America.

Lepidozia grossiseta, St.—Robust, bright green, in dense mats. Leaves imbricate plano-distichous rather decurved, quadrifid to the middle, subvertically inserted 1.4 mm. long, basal disk nearly quadrate, lobes erect setaceous and uniseriate above, the inner ones 4-celled at base, the outer ones often 2-celled, sometimes all 2 or all 4-celled; cells of the disk 75 x 40 μ ., those of the lobes up to 120 μ .; underleaves smaller, lobes very slender, usually uniseriate to the base.

West Coast. Trowutta.

Lepidozia mooreana, St.—Pale green or almost colourless, closely resembling a *Trichocolea*, stems often 4-6 cm. long, regularly pinnate. Stem leaves symmetric rather crowded transverse, disk broadly obtuneate, 0.6 mm. broad, 0.3 mm. high, cells 70 x 30 μ .; lobes usually 9-10 setaceous, 0.8 mm. long, uniseriate from a 2-celled base, cells 120 x 30 μ .; underleaves smaller, usually 5-6 lobed, otherwise similar. Perianth 6 mm. cylindric, mouth fimbriate.

West Coast. Hartz Mt. Cradle Mt.

Lepidozia levifolia, Tayl.—Seldom exceeding 5 mm., irregularly branched. Leaves nearly transversely inserted, asymmetric imbricate spreading strongly incurved, 0.3 long and broad, 1-3rd- $\frac{1}{2}$ quadrifid, dorsal margin three times as long as the ventral, dorsal lobe small, middle ones 0.1 mm. long, broad, but acute, 7-8 cells broad at the base, 10-12 cells long; cells 16-20 μ .; underleaves shorter, twice as broad as the stem, quadrifid to the middle. Variable but distinguishable from the other asymmetricae by the smaller concave leaves.

Very common.

Lepidozia procera, Mitt.—Stems 1-3 cm., branches decurved with long slender tips. Leaves remote and closely appressed on the main stem, closer and patent on the

branches, asymmetric 0.6 mm. shortly quadrifid, lobes nearly equal triangular mostly 6 cells broad at the base; cells 17 μ .; underleaves small quadrate not broader than the stem, deeply quadrifid.

Common.

New Zealand.

Lepidozia parvixeta, St.—Slender elongated often to 6 cm., branches long flagellate. Leaves asymmetric, obliquely obtuse, all remote and closely appressed, 0.5 mm., dorsal border curved more than twice as broad as the ventral quadrifid to the middle, lobes broadly lanceolate 4-8 cells broad at the base; cells 18-27 μ . long; underleaves as broad as the stem, very short quadrifid to the middle.

Very close to *L. procera*, and probably only a form of it.

Very common.

New Zealand.

Lepidozia chordulifera, Tayl.—Small slender generally densely massed. Leaves subtransverse asymmetric 0.6 mm. long, quadrifid to the middle, disk oblique, dorsal margin twice as long as the ventral 1-2 dentate, lobes diverging lanceolate very acute 8-9 cells broad at the base, usually one or more armed with a lateral tooth; cells 17 μ .; underleaves nearly as large as the leaves, broader than long, deeply quadrifid.

Mt. Wellington. Mt. Field. West Coast.

South America.

Lepidozia asymmetrica, St.—Rather robust, many branched and densely massed, lower branches sometimes with flagellate tips, upper ones terminating abruptly. Leaves imbricate asymmetric, concave, the lobes incurved 0.9 mm. long, 0.8 mm. wide, quadrifid to the middle, dorsal margin broadly expanded, lobes broad 4-12 celled at base acute; cells 27 μ .; underleaves less than half as large, 2-3rd quadrifid, lobes very acute.

Very common.

Form. parva.—Habit and appearance of the type only smaller in all details. Leaves 0.5 mm., 1-3rd quadrifid, lobes about 12 celled at the base. Approaching *L. chordulifera*, but lobes not spreading and without the lateral teeth.

The species has a distinct habit, but no clearly defined characters marking it from its relatives.

Lepidozia glaucophylla, Tayl.—Robust and glaucous, freely branched, the lower ones flagellate. Leaves oblique asymmetric ovate-truncate, 1-3rd quadrifid, but some tri or bifid, 0.9 mm. long, those on branches smaller often minute; lobes lanceolate, inner ones usually 7-9 cells at base, outer ones 2-3 celled but variable; cells 15-20 μ ; underleaves half as large as leaves, rather broader than the stem, quadrifid to the middle. Cuticle minutely asperate.

Mt. Wellington. Adamson Peak.
Australia. New Zealand.

Lepidozia albula (Tayl.), *L. ulothrix* (Lindb.).—Very variable in habit, often forming yellow mats, branches often with flagellate tips. Leaves crowded imbricate asymmetric quadrifid below the middle, 1.4 mm., dorsal margin strongly curved armed with generally 5-6 unequal spines, lobes acute simple or armed; cells unequal thick walled 20-30 μ ; underleaves broader than long, half as large as leaves, deeply cleft into 4 slender deeply bifid lobes, but varying from 2-6 lobed, armed or not.

Very variable in habit, size, shape of lobes, and armature, but always distinguishable by the deeply bifid lobes of underleaves.

Very common.

Auckland Islands.

Lepidozia appendiculata, St.—Medium size, the branches sometimes 3 cm. long. Leaves closely overlapping asymmetric deeply 6-lobed, 1 mm. long, 1.4 mm. broad, lobes narrow-lanceolate diverging, margin armed with many long simple or compound 1-cell spines, and surface at least when young covered with small-celled proliferation. Underleaves similar but smaller. "Perianth large to 1 cm. long, base fleshy, mouth spinulose."

A very distinct and rare species. Only found hitherto in swampy land near Kingston. The above description is partly adapted from Stephani, as only one or two scraps are present in the author's collection.

LEMBIDIUM, MITTEN.

Branches erect from a stoloniferous base; stems thick with numerous slender more or less circinate pinnate or bipinnate branches. Leaves transverse, stem-clasping appressed to patulous, deeply divided into linear incurved lobes to entire concave, branch leaves smaller; underleaves similar nearly as large to rudimentary; cells medium size

with thick walls. Archegonia on short ventral branches; perianth long, narrow trigonous, mouth constricted.

The commoner Tasmanian plant differs from *Lepidozia* in little but habit.

Lembidium tenax (Grev.), St.—Branches 1-2 cm. Stem leaves closely appressed, reniform divided to the middle into 6-8 slender lobes, margin of disk dentate, leaves of branches more spreading quadrifid, ultimate leaves very small triid.

Placed by Lindberg in *Lepidozia*, to which it appears to have at least equal affinity.

Common.

East Australia. New Zealand. Auckland Islands.

Lembidium anomalum, Rod.—Stems pinnately branched ascending from a creeping stoloniferous base, dark livid green. Leaves imbricate to distant incubous or sub-transverse, rotund very concave erect, 0.9 mm., margin entire; cells unequal mostly 18 μ , sometimes a band of pale cells on the margin, walls rather thick, trigones large to small, cuticle smooth; underleaves similar in size and shape to the leaves. Bracts oblong 2 mm. adherent to the perianth; perianth terminating a short lateral branch, narrow cylindric, 8 mm. long, mouth tapering fimbriate, capsule oblong.

Cradle Mt. West Coast.

PSILOCLADA, MITTEN.

Plants small, dark, usually creeping amongst more robust mosses. Stems small, slender, branched. Leaves succubous remote, patulous 4-6 lobed, lobes slender, cells rather small with thick walls; underleaves transverse, little smaller than the leaves, deeply 4 or 3-lobed. Perianth on short lateral branch cylindric curved apex split into numerous slender laciniae, bracts numerous deeply 3-4 lobed, lobes many dentate.

Very like *Lepidozia*, only leaves succubous and perianth and bracts different.

Psiloclada clandestina, Mitt.—Very small, bipinnate. Leaves 0.3 mm., base patent, lobes erect, lobes 4-6 slender, cells 17 μ ; underleaves as broad as the stem, sinuately inserted, 2-3rd quadrilobed.

West Coast.

New Zealand. New Guinea. South Africa.

BLEPHAROSTOMA, DUM.

Small and slender with few lateral branches. Leaves succubous to nearly transverse more or less remote, patent, 4-8 lobed, lobes with setaceous apices and armed with spinous teeth; cells rather large with equally thickened walls; underleaves similar. Perianth terminal cylindric, mouth lobed and armed with spinous processes.

Blepharostoma pulchella (Hook.), St.—Stems from very short to 2 cm. Leaves reniform concave mostly divided half-way into 4 broad lobes, lower leaves often 8-upper 12-lobed, tip of each lobe elongated into a spine about 6 cells long 1 cell wide, 0.5 mm. long without the spinous apex, each lobe armed with about 4 spines; cells of base mostly $50 \times 22 \mu$, those of the spines mostly $60-90 \times 17 \mu$, cuticle of upper cells asperate, lower ones striate. Perianth 1.2 mm.

Mt. Wellington. Mt. Hartz. West Coast, Etc.
New Zealand.

TRICHOCOLEA, DUM.

Robust pale flaccid densely caespitose; stems usually bearing numerous paraphylls, copiously bipinnate. Leaves succubous crowded patent concave, deeply 3-5 lobed, incisions acute and lobes rapidly tapering to a long spine, lobes armed with numerous simple or compound spines; all cells large; underleaves smaller but similar. Perianth absent; calyptra terminal oblong densely covered with coarsely spinous paraphylls.

Trichocolea australis, St.—Robust, often 10 cm. long, pale, copiously branched. Leaves crowded the disk rather narrow gradually separating into the lobes; cells of disk $50 \times 21 \mu$, those of the spines longer and narrower, cuticle striate. Calyptra obovate, 3 mm. long. Spores ferruginous spherical coarsely asperate 15μ diameter.

Differing from *T. tomentella* (Ehrh.), Dum., in the leaf, being less deeply divided as well as in the asperate spores.

Very common.

New Zealand.

CHANDONANTHUS, MITTEN.

Stems rigid, robust, simple or with few lateral branches. Leaves transverse or slightly oblique, imbricate, deeply 2-4 lobed, base usually armed with few spinous teeth, lobes broad acute entire or lobed; underleaves smaller, deeply 2-lobed, lobes slender. Perianth terminal

often thrown to one side by a robust innovation, campanulate, deeply plicate, mouth slightly contracted coarsely dentate.

Chandonanthus squarrosus (Hook.). Mitt.—Robust, reddish-yellow often 5 cm. long, more or less covered with paraphylls. Leaves broad undulate, squarrose, bilobed to the middle, lobes very broad, apex acute, 2.5 mm. long, margin generally entire; cells 21 μ ., walls sinuous, trigones as large as the cells. Perianth 5 mm., mouth strongly ciliate-dentate.

Slender creeping forms often have leaves only 1 mm. long and underleaves very reduced.

Mt. Wellington. Hartz Mt. Adamson Peak. Cradle Mt. Blue Tier, Etc.

New Zealand.

HERBERTA, S. F. GRAY.

Stems long slender simple or with sub-floral innovations generally depressed amongst undergrowth. Leaves transverse divided below the middle into two equal acute lobes, secund; cells rotund about 21 μ ., walls sinuous, trigones about as large as cells; cells of the middle base and lobes much larger; underleaves as large as and similar to the leaves. Perianth terminal usually in the fork of branches, immersed in the bracts, slender, 3-keeled, mouth plicate and deeply laciniate.

Referred by Stephani to *Schisma*. By Nees to *Sendtnera*.

Herberta oldfieldiana (St.).—Stems long slender, wiry rigid. Leaves narrow oblong, 1.5 mm. long, divided below the middle into two lanceolate acute lobes, margins mostly entire, sometimes a few irregular dentitions present.

Also known as *Schisma juniperina*, etc.

Mt. Wellington. Mt. Field, Etc.

LEPICOLEA, DUM.

Robust erect to pendulous, yellowish, pinnate, the branches with flagellate tips. Leaves closely imbricate bisbifid, lobes narrow with long slender tips; underleaves as large as and similar to the leaves; cells oblong 15 x 27 μ ., basal centre cells much larger, apical cells very long single series, trigones huge confluent. Perianth generally terminating lateral branches oblong densely covered with paraphylls.

Leaves divided below middle *scolopendra*

Leaves 1-3rd divided *ochroleuca*

Lepicolea scolopendra (Hook.), Dum.—Leaves erect imbricate tips decurved primary division 2-3rd, division of the lobes nearly as deep, ventral margin with few subulate teeth, 2 mm. long.

Very common.

Asia to New Zealand.

Lepicolea ochroleuca (Spreng.), Spruce.—Leaves with a rather broad stem-clasping base, divisions not extending below the middle, otherwise as in *L. scolopendra*.

A doubtful species with many connecting forms.

Common in woods.

South Africa. South America. New Zealand.

BAZZANIA, S. F. GRAY.

Plants mostly robust, stems repeatedly forked and producing long small leaved flagella from the ventral surface. Leaves incubous, plano-distichous, crowded and imbricate commonly ovate with a three toothed apex, rarely bifid with unequal lobes; cells usually rather small with thick walls; underleaves always present, roundish quadrate 4-lobed or with an erose apex. Perianth on a short basal branch, linear to fusiform, mouth usually fimbriate.

Stephani in his Species Hepaticarum has adopted the name *Mastigobryum*, but *Bazzania* is a prior name, and is now the one more commonly used.

1. Leaves 3 dentate 2
Leaves 2 lobed 5
2. Leaves linear-ovate *accreta*
Leaves ovate 3
Leaves with a middle series of long
cells *monilinerve*
3. Leaf margin entire or with few serrations *involuta*
Margin and lobes with many serrations ... 4
4. Underleaves much broader than long ... *adnexa*
Underleaves nearly rotund *baileyana*
5. Lobes rather obtuse nearly equal *colensoi*
Lobes acute very unequal *anisostoma*

Bazzania accreta (L. et L.).—Leaves closely imbricate slightly decurved, strongly so when dry, linear ovate, falcate, 1.7 mm. long, apex narrow with 3 short unequal broad diverging teeth, margin otherwise plain or with one or two minute serrations on each side below the apex, cells 20-30 x 15 μ ., walls thick, trigones convex; underleaves rather broader than the stem, shortly connate on

both sides with the leaves reflexed oblong-quadrate, rather longer than broad apex irregularly dentate.

Very common.

East Australia.

Bazzania involuta (Mont.).—Leaves broadly ovate falcate decurved, 1.5-2 mm. long, apex narrow with 3 short acute diverging teeth, sometimes with a few serrations intermixed, upper cells 15-18 μ ., walls thick, lower 30-45 μ ., trigones rotund; underleaves nearly reniform 2-3 times as broad as long, apex erose-dentate, reflexed, shortly connate on both sides, upper cells often larger and hyaline.

Very common in forests.

New Zealand. Fuegia.

Form. elegans, *B. elegans*, Col.—Regularly forked; leaves very close and regularly spreading.

Hartz Mt.

Bazzania adnixa (L. et L.).—Leaves not as strongly deflexed as in allied species, broadly ovate, falcate 2 mm. long, dorsal base broadly overlapping the stem, apex truncate tridentate, teeth acute, they and the upper portions of the margins armed with few small acute serrations, when growing in deep shade the leaves are shorter and serrations less marked; when growing on firm bark the flagella creeping and bearing leaves similar to those of the stem only smaller and nearly entire; cells 18 μ ., with thick walls, trigones large acute; underleaves quadrate broader than long, apex erose-dentate, upper cells large hyaline, base shortly connate with the leaves, slightly reflexed.

Some forms approximate to *B. involuta*.

Very common.

New Zealand. South Africa.

Bazzania baileyana, St.—Very similar in habit to *B. adnixa*, but leaves still less decurved, less rigid and narrower, dorsal base less expanded, 1.5-1.7 mm. long, apex truncate with three sharp diverging teeth more or less armed with short sharp serrations; underleaves nearly free reflexed, more rotund than quadrate, twice as broad as the stem.

Very close to *B. adnixa* and probably not always separable.

Adamson Peak.

East Australia.

Bazzania monilinerve, Nees.—Small with few forks 1-3 cm. long. Leaves slightly deflexed imbricate, but not very crowded, nearly rectangular but with an expanded dorsal base, 1.2 mm. long, apex truncate with three acute diverging teeth, a broad band of long cells between the dorsal margin and the centre; cells of the wing very irregular, $10.15\ \mu$, walls thick trigones none, cells of the vitta $35-45\ \mu$, trigones large convex; underleaves rotund, nearly half as long as the leaves, erect, free.

Common in forests.

Eastern Australia.

Bazzania colensoi (Mitt.)—Small. Leaves imbricate, slightly deflexed 0.7 mm. long, almost rectangular, the dorsal margin convex near the base, ventral margin straight, apex $\frac{1}{4}$ -1-3rd bifid, lobes ligulate slightly acute, dorsal lobe about 9 cells wide at base, ventral lobe about same length but only 3-5 cells wide; cells $18-25\ \mu$, walls thick trigones none, cuticle granular; underleaves free as narrow as the stem, about as long as broad, 3 lobed, lobes obtuse. Perianth fusiform, apex tapering, 3.5 mm. long.

Tasman Peninsula. Trowutta.

East Australia. New Zealand.

Bazzania anisostoma (L. et L.)—Stems slender erect in dense mass, or when few develop procumbent. Leaves imbricate linear-ovate, sharply deflexed, 0.7 mm. long to 1-3rd bifid, dorsal lobe broad, acute, ventral much longer, narrow and very acute; cells of the dorsal wing $10\ \mu$, others $35\ \mu$, walls thick trigones none; underleaves free quadrate rotund, not broader than the stem trilobed, lobes very obtuse.

B. mooreana, St., is the robust form of the plant.

West Coast. Hartz Mt. Cradle Mt., etc.

East Australia. New Zealand. Fuegia.

CALYPOGEIA, RADDI.

Slender branches, few arising from the ventral surface. Leaves incubous alternate, generally ovate with an obtuse apex, rarely bidentate; underleaves present much smaller than the leaves, usually bifid. Calyptra sunk in a relatively large descending fleshy marsupium situated on a short ventral branch remote from the apex.

Calypogeia tasmanica, Rod.—Slender in loose mats, often 3-5 cm. long. Leaves not crowded but little overlapping, rotundo-ovate, apex entire or rarely shortly bilobed 1 mm. long; cells hexagonal, walls rather thin,

trigones none, 30-45 μ .; underleaves free, bifid or trifid divided to the middle, lobes obtuse, half as long as the leaves. Sterile.

Adamson Peak.

LEPIDOLAENA, DUM.

Decumbent with many lateral pinnate branches, more or less purple. Leaves incubous imbricate concave bilobed, dorsal lobe large rotund, ventral lobe a small clavate water-sack, closely attached to the ventral base of the larger lobe; underleaf broad sub-rotund, bifid or quadrifid; leaf and underleaf often bearing water-sacks similar to the lesser lobe. Perianth terminal or thrust aside, large oblong covered with numerous broad ciliated scales.

Underleaf bifid *magellanica*

Underleaf quadrifid *brachyclada*

Lepidolaena magellanica (Lam.)—*Schiffn.* Robust with wide spreading pinnate branches to linear with short branches. Leaves broadly ovate to rotund, margin armed with spines, about 1 mm. long; cells rotund 22 μ .; trigones large convex; underleaves nearly as large as the leaves reniform to rotund with a shortly bifid apex, margin with few or many cilia. Perianth up to 1 cm. long membranous, calyptra adnate to the perianth with a free apex bearing sterile archegonia above, capsule narrow oblong on a short stalk quadrivalved to the base.

Very common.

Australia. New Zealand. Fuegia.

Lepidolaena brachyclada (Lehm.), *St.*—Stems very long; lateral branches very short distant, yellowish-green to more or less purple. Leaves broadly ovate up to 1 mm. long, margin armed with filiform spines, ventral lobe nearly half as long as the leaf, lanceolate, very acute, with about four spines on the ventral and a dark clavate sack on the dorsal margin; cells 22 μ ., walls irregularly thickened, trigones medium convex; underleaves broad quadrifid to the middle more or less armed with slender spines.

Mt. Wellington. West Coast. Not common.

Form. alpina.—Short with numerous bold lateral branches, dark purple. Leaves entire or with few small spines; ventral lobe rudimentary on the main stem, on the branches well developed, but the ventral section entire; cells with equally thickened walls; underleaves deeply divided, lobes armed.

Mt. Wellington. Hartz Mt. Adamson Peak.

DIPLOPHYLLUM, DUM.

Stems suberect to decumbent from a creeping rhizome. Leaves bilobed, complicate, keeled, dorsal lobe smaller than the ventral and flattened upon it, rarely both equal; underleaves none. Perianth terminal oblong, irregularly plicate, mouth rather contracted fimbriate.

Lobes unequal, nude *domesticum*

Lobes equal, ciliate *densifolium*

Diplophyllum domesticum (G.), St.—Stems thick fleshy with rhizoids on the ventral surface. Leaves plano-distichous slightly ascending, oblong falcate obtuse, 0.8-1 mm. long, margin serrulate, dorsal lobe half as large closely appressed, the junction curved not winged, cells 12 μ ., walls thick, basals much larger, cuticle loosely verrucose. Bracts similar to the leaves only larger; perianth 3 mm. long, apex colourless.

Mt. Wellington. Adamson Peak. Western Tiers, etc.

East Australia.

Diplophyllum densifolium (Hook.), St., *D. vertebralis* (Tayl.), St.—Decumbent simple, often 5-6 cm. long, reddish green. Leaves plano-distichous, closely imbricate, sheathing base, bilobed very low down, lobes equal oblong, apex bifid, 2.5 mm. long, margin ciliate; cells 22 μ ., trigones small convex, cuticle papillate.

Mt. Wellington. Adamson Peak. Cradle Mt., etc. Auckland Is. Fuegia.

Form. decurvum.—Leaves decurved; apex of each lobe very shortly or not at all bifid; cells 27 x 9 μ ., walls very thick continuous.

West Coast.

BALANTIOPSIS, MITTEN.

Closely decumbent. Leaves succubous, plano-distichous, deeply bilobed, dorsal lobe the smaller and closely appressed to the ventral, lobes rotund and always armed on the margin; underleaves closely appressed with a deeply sinuate insertion and a bi- or quadrifid apex, always armed. Sporophyte in a large descending apical marsupium.

Balantiopsis diplophylla (Tayl.), Mitt.—Green or reddish, usually in dense decumbent masses. Leaves crowded, imbricate, ventral lobe ovate rotund asymmetric, 1.5 mm., nearly vertically inserted, armed with few

or many cilia chiefly along the ventral margin, dorsal lobe similar two-thirds as large; cells rectangular $24 \times 45 \mu$, walls equal thin, trigones none, lower cells much larger; underleaves half as large as the ventral lobe, reniform, deeply quadrifid, armed with long cilia.

Very common on clay banks.

Australia. New Zealand.

Form. paucidentata.—Leaves entire or with few broad irregular teeth, dorsal lobe $\frac{1}{2}$ ventral; underleaf oblong one-fifth bifid with few lateral broad teeth.

Balantiopsis acuiloba, Berg.—Very close to the last in all details. Dorsal lobe as broad as the ventral but shorter; underleaves oblong, 1-3rd bilobed armed with numerous cilia to deeply 4-lobed. Both species as found in Tasmania vary and run into one another. This description applies to a plant determined by Stephani. It is doubtful if we possess the typical form.

Common.

New Zealand.

SCHISTOCHILA, DUM.

Plants robust, stems simple or with few irregular-branches, thick fleshy, often bearing paraphylls between the leaves. Leaves two lobed, the dorsal smaller than, or often nearly equal to, the ventral, attached by nearly the whole of its length to and within the margin of the ventral lobe, the dorsal margin of the ventral lobe then forming a single wing, or joined by a commissure from the adjacent surfaces, and then both margins free, forming a double wing. Sporophyte terminal deeply sunk in the axis, the calyptra immersed in large bracts, some of which are attached to it. No perianth.

- | | | |
|----------------------------|-----|----------------------|
| 1. Underleaves absent | ... | 2 |
| Underleaves present | ... | 4 |
| 2. Margin ciliate | ... | <i>ciliigera</i> |
| Margin entire or nearly to | ... | 3 |
| 3. Lobes subacute | ... | <i>fragilis</i> |
| Lobes obtuse | ... | <i>spegazziniana</i> |
| 4. Margin ciliate | ... | 6 |
| Margin dentate | ... | 5 |
| Margin entire | ... | <i>parvistipula</i> |
| 5. Underleaf 4-lobed | ... | <i>ichmanniana</i> |
| Underleaf subrotund bifid | ... | <i>pachyla</i> |
| 6. Cilia 1 celled | ... | <i>tasmanica</i> |
| Cilia 2-3 celled | ... | <i>ciliata</i> |

Schistochila ciliigera (Tayl.), St.—Robust, often 6 cm. long, yellow. Leaves ovate-cordate, acute, crowded, 4 mm. long, squarrose, the two lobes almost equal united for five-sixth of length, margin bearing numerous slender cilia; wing at junction of the lobes narrow also ciliate; underleaves absent. Bracts enlarged, calyptra cylindric, 2 mm., mouth fimbriate completely immersed, upper bracts adnate to the calyptra.

West Coast. Hartz Mountains. Cradle Mountain, etc.

Stewart Island.

Schistochila tasmanica, St.—Robust, often 4 cm. long. Leaves broadly ovate cordate, apex obtuse, crowded squarrose, 5 mm long; lobes almost equal united beyond the middle, wing narrow double, margin and wing armed with numerous single-celled cilia; underleaves 2-3 mm. long, deeply divided into two spathulate lobes, copiously ciliate. Bracts not much larger than leaves, calyptra deeply immersed. Trigones small concave. Very close to *S. ciliata*, differing principally in the cilia being one-celled.

Mt. Wellington. Adamson Peak. West Coast, etc.

Schistochila ciliata (Mitt.), St.—Robust. Leaves closely imbricate, oblong, obtuse, 4-5 mm. long, lobes equal, 2-3rd combined, margin armed with long cilia each 2-3 celled, wing double narrow usually entire; underleaves half as large as leaves divided to the middle into two spathulate lobes armed with many cilia. Calyptra very small, deeply immersed. Trigones medium convex.

Mt. Hartz. West Coast.

New Zealand.

Schistochila Ichmanniana (Lindb.), Nees.—Very robust often 10 cm. long, pale greenish or yellow, stem thick with paraphylls amongst the leaves. Leaves ovate acute, the dorsal lobe rather shorter than the ventral, 6 mm. long, crowded squarrose, margin armed with numerous short, sharp teeth, lobes $\frac{3}{4}$ adherent with a double wing, wings narrow entire or nearly so, the ventral wing the broader and also a small supplementary wing towards the apex of the ventral lobe; underleaf 2 mm. long, 4 mm. wide, 4-lobed to middle, lobes and basal margin armed with a few cilia.

Very common in forests.

Stewart Island.

Schistochila fragilis, St.—Robust but short, closely procumbent. Leaves oblong, obtuse, 3-4 mm. long, imbricate squarrose entire or with a few small teeth at the apex, dorsal lobe smaller, adnate to the ventral about one-third within the margin, shortly free at the apex, margin entire. Underleaves none.

Mt. Hartz. Cradle Mt. West Coast. Trowutta.

Schistochila pachyla (Tayl.), St.—Robust, often elongating to 10 cm. Leaves crowded ovate-cordate, 5 mm., margin armed with few short broad teeth, dorsal lobe same size entire, wing double narrow linear, entire. Underleaves large rotund, apex bilobed, margin entire or lobed, often armed with a few cilia. Distinguished from *S. lehmanniana* by the entire wings and different underleaf and usual absence of paraphylls, but some forms appear intermediate.

West Coast. Adamson Peak.

Fuegia.

Schistochila parvistipula, Rod.—Stems mostly about 3 cm., decumbent, copiously radiculose, thick, fleshy. Leaves squarrose, loosely imbricate, broadly ovate obtuse, 4 mm. long, lobes nearly equal and united to the apex, dorsal lobe attached by the margin, wing single relatively broad, margins entire but often an obscure tooth near the apex of the dorsal lobe; cells rotund 35-50 μ ., walls rather thin, trigones small concave; underleaves oblong, rather narrower than the stem, 1.3 mm. long, bifid below the middle, lobes lanceolate acute, margin with few ill-defined teeth.

Cradle Mt.

Schistochila spegazziniana (Massal), St.—Robust, rigid, decumbent, reddish brown, often 10 cm. long. Leaves crowded, squarrose, ovate, 5 mm. long, obtuse, entire; dorsal lobe the same size or little shorter, apex rotund, entire; underleaves none.

A few scraps on Button Grass Plains, West Coast. Stephani marks its determination as uncertain.

Fuegia.

RADULA, DUM.

Prostrate, pinnate or bipinnate branches, pale green. Leaves incubous, plano-distichous, patent, obliquely oblong entire; ventral lobe very small appressed, base broadly attached to the stem, inner margin free, outer margin attached by at least most of its length to the leaf, apex usually short, straight, with usually an obtuse

or more or less acute inner angle, often much inflated within the outer margin. Antheridia in some species, single within the ventral lobes, which are then much enlarged, in other species within the small leaves of short clavate axillary amenta. Perianth terminal terete, usually flattened above with a wide mouth, 2-4 mm. long.

A large genus of closely graded forms. Some of the latter are doubtful as species.

1. Lobule closely appressed 2
Lobule not closely appressed 7
2. Lobule under one-fifth size of leaf 3
Lobule one-third or more size of leaf 5
3. Leaves remote, lobule hardly inflated *buccinifera*
Leaves contiguous, lobule inflated 4
4. Trigones well developed *mittenii*
Trigones obsolete *wattsiana*
5. Lobule nearly rotund, little inflated .. *uvifera*
Lobule rhomboid 6
6. Leaves nearly flat *physoloba*
Leaves strongly decurved *tasmanica*
7. Lobule erect 8
Plant minute, lobule nearly as large as leaf *ancurysmalis*
8. Reddish, leaves strongly decurved ... *plicata*
Green, leaves nearly flat *weymouthiana*

Radula buccinifera, Tayl.—Leaves rather remote, obliquely oblong, very obtuse, 0.8 mm. long, 0.5 mm. wide, slightly concave; ventral lobe very small quadrate with a very decurrent base, closely appressed, hardly inflated, apex with a very obtuse angle; cells 9-18 μ ., cuticle minutely asperate. Perianth 2-3 mm. long, mouth not much compressed, crenulate.

Very common.

Australia. New Zealand.

Radula physoloba, Mont.—Leaves imbricate, concave, overlapping the stem, obliquely ovate, very obtuse, 1.2 mm. long, 0.8 mm. wide; ventral lobe large inflated oblong; stem insertion very short, apex very short, angle obtuse; cells 10 μ ., convex to papillate, walls rather thick, trigones small, concave. Perianth 3 mm. long, narrow, mouth entire.

Common.

Auckland Is.

Radula plicata, Mitt.—Reddish. Leaves obliquely oblong, very obtuse, imbricate, decurved, 0.8 mm. long, 0.4 mm. wide, dorsal margin overlapping the stem; ventral lobe quadrate half as large as the leaf to smaller, little inflated below, not closely appressed, apex broadly concave-truncate, angles obtuse; cells 10 μ ., walls thick, trigones not apparent, middle and lower cells much larger, margins with small irregular serrulations, cuticle coarsely verrucose. Perianth 1.7 mm., little flattened, 8-10 plicate, mouth more or less fimbriate.

Mt. Field.

New Zealand.

Radula uvifera, Tayl.—Leaves closely imbricate, overlapping the stem broadly ovate, oblique, apex obtuse, decurved, 1.2 mm. long, 0.8 mm. broad; ventral lobe 1-3rd as large, closely appressed, base very short, inner margin broadly expanded, outer margin little curved connate throughout, inflation slight, apex short straight, angle small obtuse. Antheridia on amenta. Cells 10-12 μ ., trigones large, cuticle convex to papillate.

Mt. Hartz. West Coast.

New Zealand. Auckland Is.

Radula tasmanica, St.—Leaves broadly ovate, obtuse, imbricate, strongly decurved, 1.2 mm. long, 0.6 mm. wide, ventral lobe 1-3rd as large, ovate truncate to rhomboid longer than wide, strongly inflated, apex short, angle obtuse, base rather broad; cells 18 μ ., trigones small, acute. Antheridia on amenta. Perianth 4 mm., clavate, mouth broad, entire.

Though much the appearance of *R. physoloba*, it is readily distinguished by the strongly decurved leaves. This is not a distinct species, it is the form assumed by *R. ancurysmalis* under favourable conditions. I have specimens in which the ends of the shoots of typical *R. ancurysmalis* have grown into the typical form of *R. tasmanica*. As the student will seldom find this condition, the descriptions are here still maintained separate.

Mt. Hartz. Adamson Peak. Cradle Mt., etc.

Radula mittenii, St.—Leaves contiguous but not imbricate, broadly oblong, obtuse, slightly falcate and concave; 1.5 mm. long, 1 mm. wide, slightly overlapping the stem; ventral lobe small quadrate, slightly inflated below, appressed above, angle obtuse; cells 18 μ ., trigones hardly apparent, walls convex. Perianth slender clavate 3 mm. long, mouth crenate.

Doubtfully distinct from *R. buccinifera*. Probably only a robust form.

Mt. Wellington. Tasman Peninsula.

New Zealand. Norfolk Is.

Radula weymouthiana, St.—Very pale. Leaves nearly rotundo-reniform to ovate, very obtuse, patent, overlapping the stem, imbricate, 0.8 mm. long, 0.7-1.0 mm. wide, ventral angle very decurrent; ventral lobe half as large as the leaf, taller than broad, quadrate rotund, little inflated below, angle obtuse but often elongated and recurved, more or less undulate; cells 10-18 μ , trigones none, cuticle smooth. Perianth about 2 mm. long, flat above mouth, broad entire.

Very distinct from other Tasmanian species in the shape of the lobule.

Tasman Peninsula.

Radula wattsiana, St.—Leaves ovate-elliptic with a very obtuse apex, little imbricate, the dorsal margin only slightly overlapping the stem, 1.2 mm. long, 0.8 mm. wide, ventral angle decurrent; ventral lobe small quadrate inflated and convex, below angle very obtuse; cells 18 μ , surface convex, trigones none. Perianth linear below, very flat and broad above, 3 mm., mouth crenate.

Very like *R. buccinifera*, but the leaves larger and closer and the lobule more inflated and convex; strongly approaching *R. physoloba*.

Slopes of Mt. Field.

East Australia.

Radula aneurysmalis, Tayl.—Very small, amongst other bryophytes on bark. Leaves nearly rotund, 0.3-0.5 mm. long, very concave; ventral lobe rhomboid, inflated nearly as large as the leaf, not appressed, angle acute; cells 18 μ , walls thin, trigones none, surface convex.

Common.

FRULLANIA, RADDI.

Closely creeping on bark or rock, pinnately branched, often dark, sometimes green. Leaves closely imbricate, incubous, rotund to reniform, entire, bearing near the ventral base an appressed lobule in the form of a water-sack with the mouth pointing downwards, strongly curved with a very oblique mouth to saccate with a straight mouth. Underleaves rotund to obcuneate, apex more or less deeply bifid. Bracts enlarged. Perianth oblong, dorsally flattened to nearly cylindric, often with a strong

ventral keel, apex obtuse with a very small tubular mouth. Capsule spherical, not split to the base, elators attached to the apex of the lobes.

Sub-genus *Galeiloba falcata*. Lobule strongly curved with a very oblique mouth, base swollen, apex acute.

1. Perianth smooth with a ventral keel 2
 Perianth smooth without a keel ... *deplanata*
 Perianth hairy when young 4
2. Trigones concave, walls straight 3
 Trigones convex, walls sinuous *scandens*
3. Most underleaves dentate *proboscifera*
 Underleaves entire *falciloba*
4. Lobule with a spinous apex *monocera*
 Lobule obtuse *rostellata*

Sub-genus *Galeiloba cucullata*. Lobule straight, helmet shaped to nearly hemispheric, placed close to and parallel to the stem, often a minute style intervening.

- Perianth smooth *cranialis*
 Perianth ribbed *pentapleura*
 Perianth hairy *pycnantha*

Sub-genus *Diastaloba*. Lobule pitcher-shaped, remote from the stem and placed obliquely, a short broad style intervening.

- Plant small, red or yellow *diplota*

Frullania falciloba, Tayl.—Rather robust, livid brown to dull green. Leaves 0.8 mm. long, 1.2 mm. broad; cells 18 μ , trigones rather large, walls nearly straight; lobule large, strongly curved, mouth elongated beyond the leaf-margin; underleaves rotund, three times as broad as the stem, 1-3rd bifid, margin entire or protuberant in the middle; bracts large, oblong, obtuse; margin generally with 1-2 short teeth, otherwise plain, lobule lanceolate laciniate; bracteole bifid with 2 lateral lobes all acute and laciniate. Perianth smooth, dorsally convex, ventrally concave with a narrow keel.

Distinguished from *Fr. proboscifera* by smaller size and larger trigones.

Occasionally in forests.

Eastern Australia.

Frullania deplanata, Mitt.—Medium size, dull green. Leaves nearly flat, obliquely ovate with an expanded dorsal base, 0.8 mm. long, 0.5 mm. broad; cells 18-24 μ , trigones medium, walls nearly straight; lobule curved short and broad; underleaves ovate-rotund, twice as broad

as the stem, 1-3rd- $\frac{1}{2}$ bifid, margins entire; bracts large, ovate, subacute, entire; lobule lanceolate, acute, bearing 1-2 laciniae; bracteole deeply bifid, often laciniate. Perianth nearly flat, smooth without a ventral keel.

Very common.

New Zealand.

Frullania proboscifera, *Tayl.*—Robust, pale green, often tinged with light brown. Leaves concave, 1.3 mm. long, 1.5-2 mm. broad; cells 16-20 μ , trigones small, concave, walls straight; lobule large, strongly curved, base swollen, apex acute; underleaves three times as broad as stem, rotund, apex shortly bifid, margin with a few small serrations or entire. Bracts large, ovate or subacute; margin entire; lobule large, lanceolate, acute, the ventral margin armed with dentate laciniae; bracteole as long as and joined to the bracts, deeply bifid, lobes very acute, margins laciniate-dentate. Perianth immersed, smooth, convex dorsally, concave ventrally, with a sharp keel, margins acute. Taylor's description is rather vague, and in a note he alludes to the perianth being longitudinally plaited. His type was gathered in Tasmania, and the form here described, which is very common, is the only Tasmanian species which can be referred to it. *Fr. cinnamomea*, *C. et P.*, is a form of this with tinted leaves and entire underleaves. *Fr. kirkii*, *St.*, is a form with green leaves and slightly larger lobule and underleaf.

Very common.

Eastern Australia.

Frullania monocera, *Tayl.*—Medium, pale green, rarely rufescent. Leaves flat or slightly concave, the margin usually slightly reflexed obliquely ovate, obtuse, dorsal base expanded, 1 mm. long; lobule curved, base swollen, apex prolonged into a slender recurved spine, cells 16-18 μ , trigones concave, walls straight; underleaves rotund, three times as broad as stem, 1-3rd bifid, margin with 2-3 bold teeth; bracts large, ovate, acute; margin dentate, lobule large, from a broad base, tapering to a slender apex, margin dentate; bracteole free bifid to middle, acute, dentate. Perianth at first immersed and covered with broad hairs, with a dorsal sulcus and broad obtuse ventral keel, becoming smooth and more exerted when old. In deep shade the lobule is very small and is often reduced to an erect lanceolate form, as figured by Mitten under *Fr. spinifera*.

Mt. Wellington. Meander, etc.

Australia. New Zealand.

Frullania rostellata, Mitt.—Medium, light reddish-brown. Leaves obliquely ovate-rotund, 1 mm., dorsal base little expanded, cells 18 μ , trigones small concave, walls slightly sinuous; lobule close to the stem, curved, short, inflated; underleaves about four times as broad as stem, lower ones obcuneate, upper ones rotund, shortly bifid, margin entire or subdentate. "Perianth obovate-oblong with a ventral keel, hispid rostrum large utriculate."—(Stephani.)

Specimen sterile, but determined by Franz Stephani.
West Coast.

New Zealand.

Frullania scandens, Mont.—Medium but forming large dark purple-brown to green patches on bark or rock. Leaves concave, obliquely rotund, from a narrow more or less deeply cordate insertion, 1.2 mm. long, cells 16-20 μ , trigones small rotund, walls sinuous; lobule rather large, curved; mouth slender, extending beyond the leaf margin; underleaves rather large, rotund to reniform, shortly bifid, margins entire, deeply keeled and often recurved; bracts short, broad, ovate, obtuse; margin entire, lobule narrow-oblong, ventral margin armed with about 4 lesser lobes; bracteole nearly as long as the bracts, deeply bifid, lobes slender, margin armed. Perianth clavate smooth with a strong ventral keel.

Fr. mooreana, St., is a deep red form with very cordate leaf bases.

Common.

Auckland Is.

Frullania cranialis, Tayl.—Red and closely creeping on wood. Leaves obovate, lower ones often subacute with an incurved apex, upper ones more rotund, mostly 0.9 mm. long, dorsal base shortly expanded, cells about 18 μ , trigones small, walls strongly sinuous; lobule nearly half as large as the leaf, helmet-shaped, as broad as long with a straight mouth placed close to and parallel to the stem; underleaves obcuneate, little broader than the stem, with a shortly bifid apex. Perianth obovate, smooth, with a very broad ventral keel.

Mt. Wellington. Adamson Peak. Hartz Mt., etc.
Eastern Australia.

Frullania pycnantha, Tayl.—Dark olive-green or purplish. Leaves not closely imbricate, generally diverging from the stem when moist, obliquely ovate-rotund, 0.5-

0.8 mm. long, dorsal base with a large ligulate expansion overlapping the stem; cells $15\ \mu$., trigones small, walls straight; lobule broadly helmet-shaped, close to the stem, less than 1-3rd as large as leaf, as broad as long with a straight mouth; underleaves obcuneate, little broader than the stem to 1-3rd bifid, upper margin with an obtuse angle or tooth, a minute style interposed between the lobule and the stem. "Perianth large obovate with a broad ventral keel, coarsely strigose."—(Stephani.)

Specimen sterile determined by Franz Stephani.

Near Launceston.

New Zealand.

Frullania pentapleura, Tayl.—Small, nearly black on rocks, dark green in shade. Leaves rotund not closely imbricate, diverging when moist, about 0.5 mm. long, apex incurved, dorsal base rotund, cells $15\ \mu$., trigones small, walls straight; lobule helmet-shaped, as broad as long, nearly half as large as leaf, mouth broad, straight, a minute style interposed; underleaves obcuneate, little broader than the stem, $\frac{1}{2}$ bifid; margin unidentate; bracts ovate with an entire margin, lobule lanceolate; bracteole narrow and deeply bifid. Perianth clavate convex and 3-5 ribbed on both surfaces.

Fr. reptans, Mitt., is rather more robust, growing on damp bark. *Fr. falsa*, St., a depauperated form growing on dry rock.

Very common.

Eastern Australia. New Zealand.

Frullania diplota, Tayl.—Small in mats on bark or rocks. Leaves concave ovate-rotund, apex mostly sub-acute incurved, 0.5 mm. long; cells $18\ \mu$. but variable, trigones large confluent or in marginal cells small, lobule pitcher-shaped, longer than broad, remote from the stem and not parallel to it, a short broad style intervening; underleaves little broader than the stem, obcuneate angled above 1-3rd bifid. Perianth oblong smooth, with a broad ventral keel.

Fr. congesta, H. et T., is a small dark red form, growing amongst moss. *Fr. weymouthiana*, St., is a small elongating form growing on bark.

Very common.

Eastern Australia. New Zealand.

LEJEUNIA GROUP.

Medium to minute, pinnate or irregularly branched, decumbent or ascending. Leaves incubous, erecto-patent, bilobed, dorsal lobe the largest and assuming the character of the leaf, ventral lobe or lobule inflated from small and closely appressed to the leaf to nearly as large; underleaves nearly always present, rotund to bifid to the base with erect or widely diverging lobes, rarely absent or with double the normal, namely, being one to each leaf. Bracts similar to leaves and little larger; perianth terminal but thrust aside by one or two innovations, pyriform slightly flattened, 5 plicate, rarely quite smooth, mouth minute, tubular. Capsule oblong on a short seta, valves separating to the middle, clators attached to the apex of the valve.

An enormous group now divided into many genera upon inessential distinctions.

1. Underleaves rotund or obovate 2
Underleaves bifid with diverging lobes ... 4
2. Underleaves rotund 3
Underleaves broadly obovate ... *Cheilolejeunia*
3. Lobule small *Eulejeunia*
Lobule nearly as large as leaf ... *Microlejeunia*
4. Underleaf to every other leaf . *Drepanolejeunia*
Underleaf to every leaf *Diplasiolejeunia*

Stephani has determined a Tasmanian specimen as *Strepsilejeunia austrina*, Spr. An error appears to have crept in as the portion of the gathering retained does not agree at all with that plant as described.

EULEJEUNIA, SPRUCE.

Medium size; leaves imbricate, ovate to obovate with a rotund apex, symmetric, lobule small; underleaves rotund, shortly bifid, 2-3 times as broad as the stem. Perianth in Tasmanian specimens with 5 bold keels above, smooth below.

Variable, and the species are established on unstable forms. Many are very doubtful.

1. Lobule less than $\frac{1}{4}$ size of leaf *tumida*
Lobule about 1-3rd size of leaf 2
2. Underleaf 1-3rd size of leaf 3
Underleaf nearly size of leaf *drummondii*
3. Lobes of underleaf obtuse *tasmanica*
Lobes of underleaf very acute . *cuspidistipula*

Eulejeunia tumida, Mitt.—Leaves dull olive, obovate, imbricate, slightly concave, 0.6 mm., obtuse; cells 27 μ .; lobule nearly triangular, usually about 1-5th size of leaf, carina arcuate, apex very short truncate, angle obsolete or shortly apiculate.

Mitten's original description is of a form with a very small lobule. Stephani describes as this species a plant with a large lobule, which must be erroneous.

Common in woods.

New Zealand.

Form. parvilobula.—Lobule very small, formed of about 8-10 cells, angle with a prominent cusp.

Mt. Field.

Eulejeunia tasmanica, Gott.—Leaves ovate, slightly concave, little imbricate, 0.6 mm., apex obtuse; cells 18 μ .; lobule 1-3rd size of leaf, ovate, apex obliquely truncate, angle apiculate, carina deeply arcuate, outer surface of cells of leaf convex; underleaves 2-3 times as broad as stem, bilobed to the middle, lobes narrow, triangular, obtuse.

Common in woods.

Eulejeunia cuspidistipula, St.—Leaves pallid green, contiguous, ovate, nearly flat, 0.5 mm., obtuse; cells 18 μ .; lobule 1-3rd as large as leaf, broadly ovate-triangular, carina strongly arcuate, apex emarginate, angle very acute; underleaves half as large as the leaf, deeply bifid, sinus obtuse, lobes narrow lanceolate, acute.

West Coast.

East Australia.

Eulejeunia drummondi, Tayl.—Leaves crowded, brownish, ovate, concave, obtuse, 0.9 mm.; cells 27 μ .; trigones rather large; lobule 1-3rd as large as the leaf, ovate-oblong, apex obliquely truncate, angle acute, free, margin irregular with protruding cells. Underleaves very large, 0.7 mm. diameter, nearly orbicular, bilobed to the middle, lobes broadly triangular, obtuse.

Near Latrobe.

West Australia.

CHEILOLEJEUNIA, SPRUCE.

Medium size. Leaves imbricate, plane or recurved, obtuse or rotund, often asymmetric; lobule ovate or oblong, truncate, angle acute; underleaves rather large obovate to rotund, deeply bifid. Perianth obovate compressed, 5

plicate, ventral plait narrow, long, decurrent, dorsal plait commonly obsolete.

Not differing from *Eulejeunia* in any positive character. The two Tasmanian species may be distinguished by the decurrent base of the lobule, the asymmetric leaves, and the obovate underleaves.

Cheilolejeunia gunniana (Gott.), St.—Dull dark to light livid green. Leaves little imbricate divaricate, 0.4 mm., broadly ovate, asymmetric, obtuse to subacute, the apex incurved; lobule 1-3rd as large as the leaf, inflated, carina slightly arcuate, base decurrent, angle obtuse; underleaves broadly obovate, hardly twice as broad as the stem, shortly bifid, lobes very obtuse, oblong.

Close to *L. patens*, Lindb.

Florentine Valley. West Coast.

Cheilolejeunia weymouthiana, St.—Pallid green. Leaves imbricate, very concave, broadly ovate, obtuse, asymmetric, 1 mm., lobule 1-3rd as large as the leaf, narrow ovate, carina little arcuate, base decurrent; underleaves broadly obovate, three times as broad as the stem, 1-3rd bifid.

Slopes of Mt. Wellington.

MICROLEJEUNIA (SPRUCE) JACK. ET ST.

Small, slender, vaguely branched, forming dense mats. Leaves small remote, lobule half to nearly as large as the leaf inflated; underleaves small rotund, deeply bifid. Perianth pyriform, 5 keeled.

The genus is very close to *Eulejeunia*, and often included.

Microlejeunia primordialis (Tayl.), St.—Leaves ovate obtuse distant patent, 0.2-0.4 mm.; lobule half as large as the larger leaves, nearly as large as the smaller ones strongly inflated; underleaves little broader than the stem deeply bifid.

Slopes of Mt. Wellington. Ida Bay.

New Zealand. S. America.

DREPANOLEJEUNIA (SPR.), SCHIFFN.

Plants usually minute. Leaves distant erecto-patent, lanceolate with an incurved acute apex, margin often dentate; lobule half as long as the leaf or more, ovate inflated; underleaves bifid nearly to the base, lobes acute widely spreading. Perianth pyriform, 5 keeled above, keels broad, usually armed.

Drepanolejeunia latitans (Tayl.), St.—Yellow-brown, growing amongst moss and other hepatics on bark. Leaves lanceolate acute, 0.4 mm., margin crenulate, cells $18\ \mu$.; lobule ovate, obtuse, inflated $\frac{1}{2}$ – $\frac{3}{4}$ as long as the leaf; underleaves small, $\frac{3}{4}$ bifid, one to each alternate leaf.

Common in forests.

New Zealand.

DIPLASIOLEJEUNIA, SPRUCE.

Minute. Leaves small rotund, very obtuse, distant; lobule nearly as large, very obtuse inflated; underleaves double the normal number, that is one to each leaf, bifid to the base, lobes widely spreading, slender. Perianth pyriform, smooth, 5 keeled above.

Diplasiolejeunia lyratifolia (H. et. T.), St.—Very slender, creeping amongst other hepatics, yellow. Leaves remote, orbicular, concave, 0.3 mm.; lobule broadly oblong, inflated; upper margin bifid.

Mt. Field. Mt. Hartz. Cradle Mt., etc.

ORDER ANTHOCEROTALES.

Gametophyte a decumbent branching dark green, membranous or fleshy thallus, with irregular pores on the under surface, sometimes also on the upper; cuticular cells mostly small, those of the medulla much larger, each cell with a single large simple chloroplast. Sporophyte enclosed in a cylindric involucre, filiform, forming spores continuously in basipital succession, opening in two valves from above downwards, a persistent columnella is present; the wall often possesses well-formed stomata. Spores globose, variously sculptured on the free surface; rudimentary elators of 1-3 geniculate cells present or in few instances perfect spiral elators.

ANTHOCEROS, L.

Character sufficiently described above.

- | | |
|-----------------------------------|--------------------|
| 1. Elators long spiral | 2 |
| Elators rudimentary | 3 |
| 2. Plant membranous | <i>longispinus</i> |
| Plant fleshy | <i>carnosus</i> |
| 3. Spores black echinulate | <i>brotheri</i> |
| Spores yellowish papillate | <i>laevis</i> |

Anthoceros longispirus, Carr. et Pears.—Large, fleshy, dark green, forming a flat, irregular plate, often 5-10 cm. diameter, irregularly lobed, lobes mostly flabelliform with thin irregular margins; in the middle 8-12 cells thick, margin 1-2 cells; surface sometimes with few prominent glands, otherwise smooth. Involucre 8-15 mm. long, 1 mm. diam., fleshy, mouth irregularly lobed. Capsule 2.5-4 cm. long. Spores 30 μ ., green, verruculose; elators flat, spirally coiled, 300 μ ., not septate. Wall of capsule without stomata.

Slopes of Mt. Wellington.

Anthoceros carnosus, St.—Large, fleshy, livid to dark green. Lobes flabelliform, numerous,, imbricate on surface and margin, 2-6 mm. diam., margin obtuse, very irregular, younger portions covered with prominent irregular glands; 8-10 cells thick. Involucre about 3 mm. long, very thick and glandular below, tapering to an irregularly oblique apex. Capsule 1-2 cm. Spores and elators as in *A. longispirus*.

On rotten wood in forests.

Anthoceros brotheri, St.—Large, often extending to 5 cm., thin, margin divided into numerous small rotund lobes, upper surface with numerous erect plates, surface smooth; middle about 5 cells thick, lobes 2-3 cells, cells large, surface smooth. Involucre about 3 mm. long, membranous; mouth truncate; capsule 1-3 cm., bearing stomata; spores black, coarsely echinulate, 48 μ .; elators 1-3 celled, 50-150 μ ., geniculate, but not spiral.

Kingston. Colebrook. Patrick's Head.

Mt. Field, etc.

Anthoceros laevis, L.—Dark green, 5-15 mm. diam., smooth, divided into broad obovate lobes, margin crenulate; about 8 cells thick in the middle; margin acute. Involucre about 3 mm. long, tapering from a rather broad base; capsule 1-3 cm., bearing stomata; spores greenish-yellow, 48 μ ., surface papillate; elators 1-3 celled, 50-150 μ ., geniculate not spiral.

Stephani considers our form to be distinct and names it *A. crassus*.

Kingston. Huon-road.

Cosmopolitan.

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CONTRIBUTIONS TO THE FLORA OF TASMANIA.

BY RALEIGH A. BLACK.

(Received 27th July, 1916. Read 21st August, 1916.

Issued separately 31st August, 1916.)

CHENOPODIUM CARINATUM, R. Br.

(Keeled Goose-foot.)

A much-branched strong-smelling glandular-pubescent herb; stems usually decumbent at the base, erect or ascending above, 6-18 in. long. Leaves on slender petioles; blade variable in size, $\frac{1}{4}$ - $\frac{3}{4}$ in. long or more, oblong-lanceolate to oblong or ovate-oblong, obtuse, cuneate at the base, sinuate-lobed or pinnatifid, rather thick, both surfaces rough, with glandular pubescence.

Flowers small, very copiously produced, in dense glomerules, occupying almost all the axils, sometimes elongated into short, leafy spikes.

Perianth-segments 5, erect, incurved over the fruit, more or less glandular-pubescent. Stamen usually 1. Utricle small, compressed, erect, the pericarp adherent to the seed.*

This plant was first discovered by the writer at Buckland, on the East Coast, in the autumn of 1912, and later on in that year at Rokeby. It is recorded as indigenous to all the States of the Commonwealth, including New Zealand and New Caledonia, and, no doubt, it is growing elsewhere in Tasmania, but overlooked on account of its resemblance to other members of Chenopodiaceae already recorded in "Rodway's Tasmanian Flora." The plant on both occasions was found growing in arable land of a light, loamy character, which circumstance would at first incline one to the belief that its seed had been introduced originally with agricultural seed from one of the other States or New Zealand. If this were so, one would naturally ask the question: Why is it not extant in our general farm lands, seeing that it produces such an abundance of fertile seed, exceeding that of *C. album*, L., and *C. murale*, L., which are closely related to it, and which are plentiful in our cultivated areas, and waste places? As a rule, for a

*"Manual of the New Zealand Flora," by T. F. Cheeseman, F.L.S., F.Z.S.

variety of reasons, we do not find many of our native plants becoming weeds on arable land, but from this plant's vigorous, and copious seed-producing propensity, and being able to withstand, unlike many other native plants, the drastic treatment meted out to the soil by farm implements, it bids fair to become a healthy rival to weeds of Continental origin, that farmers have to contend with, but, being an annual, it calls for no alarm, because rotation of crops and thorough and systematic cultivation should effectually dislodge it.

CAREX BICHENOVIANA, Boott.

This sedge was found by the writer in a damp situation, near the pinnacle of Mt. Direction, in the proximity of Risdon, during the early summer of 1911. Mr. Rodway included the description thereof in his "Tasmanian Flora," but added the footnote "Inserted from record only. Doubtful." The finding of this specimen will now remove the doubt.

A NEW TASMANIAN BUTTERFLY AND A LIST OF THE KNOWN TASMANIAN SPECIES.

BY G. H. HARDY.

(Received 14th August, 1916. Read 21st August, 1916.

Issued separately 31st August, 1916.)

OREIXENICA FLYNNI, sp. nov.

Female. Black-brown. Forewing with three basal spots (consisting of two large spots in the cell, the second being confluent with the third, situated at the base of area 1a.), and a band of irregular discal spots uniformly distant from the basal spots, gold-brown. A band of irregular subapical spots reaching to vein 3, containing two unequal black ocelli, red-brown, and a series of small subterminal spots, gold-brown. Hindwing with a series of basal and subterminal spots, gold-brown; discal spots gold-brown, and some suffused with red-brown, and a subtornal ocellus black.

Underside; forewing as in *O. orichora*, but a smaller second ocellus is present, and the whitish subterminal spots are smaller. Hindwing differs from *O. orichora* only by the smaller whitish spots, and the slightly smaller subapical and subtornal ocelli.

The species is undoubtedly a Tasmanian race of *O. orichora* from Victoria and New South Wales, from which the female differs chiefly in the forewing, having the space between the basal spots and discal spots uniformly wide. Width across wings 29 mm.

Hab. Cradle Mountain, Tasmania, 3,000ft. 1 specimen taken by Prof. T. T. Flynn. Christmas, 1915.

In the same locality Prof. Flynn also took *Neorexica leprca* (Hewit.) and *Argynnina tasmanica* (Lyell), the first being previously only known from Mt. Wellington, and the latter from the West Coast.

The following list contains all the Butterflies known to occur in Tasmania. *Anaphaeis teutonia* is a casual visitor to the island, and has been taken by Mr. F. M. Littler. There are also specimens, evidently caught in

Tasmania, inferior in condition, in the Museum collection.

Neolucia mathewi (Misk.) occurs in Flinders Island, and has not been met with in Tasmania proper.

Nymphalidae

DANAINAE

Danaida
petilia Stoll.

SATYRINAE

Nesoxenica
leprea Hewit.
elia W. and L.

Heteronympha
salazar Fruh.
philerope Bois.
cordace Hub.

Argynnina
hobartia Westw.
tasmanica Lyell.

Oreixenica
lathoniella Westw.
laranda W. and L.
flynni sp. nov.

Xenica
klugi Guer.

NYMPHALINAE

Precis
villida Fab.
Pyrameis
kershawi McCoy.
itea Fab.

Lycaenidae

LYCAENINAE

Candalides
acasta Cox.
Zizina
labradus Godt.

Neolucia

agricola Westw.
insulana W. and L.
hobartensis Misk.
mathewi Misk.

LUCINAE

Paralucia
aurifer Blanch.
Pseudalmenus
chlorinda Blanch.

Pieridae

Anaphaeis
teutonia Fab.

Papilionidae

Papilio
macleayanus Leach.

Hesperiidae

TRAPEZITINAE

Trapezites
glaucus W. and L.
Anisynta
tasmanica Misk.

Hesperilla
idothea Misk.
chaostola Mevr.
donnysa Hewit.
cyclopsila M. & L.
Motasingha
dominula Ploetz.

ERYNNINAE

Taractrocera
papyria Bios.
Padraona
lascivia Rosen.
flavovittata Latr.

THE DIPTERA-BRACHYCERA OF TASMANIA.

PART III. FAMILIES *ASILIDÆ*, *BOMBYLIDÆ*, *EMPIDÆ*,
DOLICHOPODIDÆ, & *PHORIDÆ*.

BY ARTHUR WHITE.

(Read 14th Aug, 1916. Issued separately 30th Nov., 1916.)

Family VII. *ASILIDÆ*.

This family comprises the well-known and universally distributed "Robber Flies," so called on account of their predaceous habits. The species are of medium or large size, the head attached to the thorax by a slender neck; front excavated between the eyes, which are separated in both sexes; thorax with well-developed bristles; wings with the normal venation of the *Brachycera*, posterior cells five in number, the three basal cells always long.

The *Asilidæ* are strongly-built predaceous flies, attacking insects of widely differing orders. I have seen a specimen of *Asilus alcetus* having as its prey a dragonfly very much larger than itself. In Tasmania the species are only of moderate size, but on the mainland of Australia some very large species occur, one of these—*Phellus glaucus*—being one of the largest known diptera.

The *Asilidæ* are divided into four subfamilies, which are distinguished as follows:—

1. "Marginal cell open, or if just closed then the radial vein sharply curved up at its end so as to form a blunt end to the marginal cell." (Verrall) 2
 - "Marginal cell closed, and with a short petiole, the subcostal and radial veins meeting at an almost equal curve." (Verrall) 3
2. Alula and hind-angle of wing missing; tarsal claws very long; abdomen extremely narrow and greatly elongated **Leptogastrinæ**
 - Alula and hind-angle of wing usually present; tarsal claws short; abdomen not extremely narrow, and only moderately elongated. **Dasypogoninæ**
3. Third antennal joint with an arista. **Asilinæ**
 - Third antennal joint without either style or arista **Laphrinæ**

Subfamily **Leptogastrinæ.**

This subfamily, which is nearly allied to the *Dasygoninæ*, is represented in the Australian Region by the single genus *Leptogaster*.

27. **LEPTOGASTER**, Meig.

(*Gonypes*, Latr.)

Extremely slender elongated flies, with long hind legs, and greatly elongated tarsal claws.

Head wider than the thorax. Antennæ placed high, making the front short, the first and second joints very short, and of about equal length, the third longer than the first two together, and terminated by an arista-like style. Moustache scanty, face long, and broader than the front. Thorax somewhat arched and nearly bare; two presutural and two supraalar bristles present. Abdomen very long and thin. Legs long and thin, the hind pair much elongated; tarsal claws greatly enlarged. Wing small, and always shorter than the abdomen, the hind-angle quite sloped away, and the alula wanting.

The species belonging to this genus are, with the possible exception of the genus *Neoitamus*, the most difficult to identify of any of the Australian Asilidæ. The different species resemble one another very closely, and further difficulty is caused by the different appearance of the two sexes, the female being usually very much the larger. After examining a considerable number of species from different parts of Australia, I have come to the conclusion that some of the characters usually relied upon for distinguishing the different species are really of little value. This applies particularly to the colouring of the thorax and the position of the cross-vein closing the second basal cell, characters that vary very much in the same species. The only characters that seem to me of general use are the colouring of the legs, the relative length of the wings, and the shape of the second submarginal cell (the space enclosed within the cubital fork), which may be either slightly contracted towards the wing margin or else wide open without any sign of contraction. In a former paper, "New Australian Asilidæ" (Pap. and Proc. Roy. Soc. Tasm., 1913), I gave a table of the various known Australian species. Since then I have had the opportunity of examining Walker's type of *L. pedanius* in the British Museum collection, which Miss Ricardo states is the same species as Macquart's *L. geniculata*, and I find that this species is apparently identical with *L. antipoda*, Bigot. The species, therefore, given in my list

as *L. antipoda* should be *L. geniculata* (which name has priority), whilst that given as *L. geniculata* is a new species, which I now describe under the name *L. autumnalis*.

This makes the Tasmanian species at present distinguished five in number.

Table of the Tasmanian Species of Leptogaster.

- | | |
|---|----------------------|
| 1. Hind femora banded; second submarginal cell slightly contracted at wing margin. | GENICULATA, Macq. |
| Hind femora not banded; second submarginal cell not in the slightest contracted at wing margin. | 2 |
| 2. Face, front, back of head, thorax and abdomen entirely black | AUTUMNALIS, Sp. nov. |
| Colouration not entirely black. | 3 |
| 3. Hind femora bright orange; wings short. | ÆSTIVA, White. |
| Hind femora brown. | 4. |
| 4. Very small species; length of wing ♀ 5.5 - 6 mm. | |
| Always clear. | VERNALIS, White. |
| Large species; length of wing ♀ 9 - 10 mm., usually smoky. | FUMIPENNIS, White. |

LEPTOGASTER GENICULATA, Macq.

Syn. *Leptogaster pedanius*, Walk.

L. antipoda, Bigot.

Face and front white; thorax brown; abdomen brown or grey; legs fawn-coloured, the posterior femora with a dark brown band; wings with the second submarginal cell slightly contracted towards the wing margin.

Length. Male, 8 mm.; female, 10 mm.

Length of wing. Male, 5 mm.; female, 7 mm.

Hab. South Bridgewater. (Also in Victoria and New South Wales).

Female. Face and front white; moustache white, scanty. Eyes closely approximated. Back of head grey. Antennæ with the first two joints dark reddish, third black. Thorax brown, indistinctly striped. Abdomen brown, with pale segmentations, practically bare. Legs fawn-coloured, with knees very narrowly black; posterior femora indistinctly banded with brown, and posterior tibiæ with apex dark brown; tarsi dark brown, with first joint white at the base. Wings shining, tinged with brown, the second submarginal cell slightly contracted towards the wing margin.

Male. No specimen of the male is at present known from Tasmania, so I take the following particulars from a New South Wales specimen, kindly sent me by Dr. Ferguson. It differs from the female in its smaller size and darker hind femora, the brown band occupying almost the whole surface, leaving merely a fawn-coloured ring towards the apex; the thorax is duller and darker, the abdomen grey instead of brown, and the wings completely hyaline; genitalia large, with thin white apical hairs, and longer black hairs on either side.

This species may be recognised without much difficulty by the banded posterior femora, and by the second submarginal cell being slightly contracted towards the wing margin, instead of being absolutely wide open, without the slightest sign of any contraction, as in the other species.

Of this species I took a single example in the hills at South Bridgewater on January 19, 1912. It seems to occur much more commonly in Victoria and New South Wales.

LEPTOGASTER ÆSTIVA, White.

Thorax and abdomen olive, the former indistinctly striped, all femora bright orange with black knees.

Length. Male, 10.5 mm.; female, 13.5 mm.

Length of wing. Male, 6 mm.

Hab. Bagdad Valley.

Male. Face white, moustache white, scanty. Antennæ black. Front pale yellowish. Thorax olive, faintly striped, the sides pale grey. Abdomen olive; first segment with a few white bristles on each side. Legs with all femora orange, the posterior pair whitish at the base; knees black; anterior and middle tibiæ orange, posterior tibiæ brown, pale at base, and becoming gradually darker towards the apex, and bearing a few white bristles; tarsi black, the first joint with basal three-fourths white. Wings very short, clear, with black veins.

Female resembles the male, but is larger; the abdomen has sides and segmentations grey, the grey colour encroaching on the second and third segments, in which the olive colour is reduced to a dorsal stripe, narrow above and broader below.

L. æstiva is distinguished from all the other Tasmanian species by its bright orange instead of fawn-coloured femora, also from all the species except *L. vernalis* by its very small, short wings.

This species occurs somewhat sparingly amongst long grass on greenstone hills. My dates range from January 12 to February 1.

LEPTOGASTER VERNALIS, White.

A very small, delicate species, with short wings. Thorax brown or grey, striped or unstriped; abdomen black or brown; legs brown, with base of posterior femora and tibiæ whitish.

Length. Male, 7.5 - 8 mm.; female, 9 - 10.5 mm.

Length of wing. Female, 5.5 - 6 mm.

Hab. Bagdad Valley.

Male. Face and moustache white. Antennæ black. Front pale yellowish. Thorax brownish, with one median and two lateral broad brown stripes, which occupy the greater part of the dorsal surface; sides and scutellum pale grey. Abdomen black, with segmentations indistinctly paler; the first segment with a few white bristles on each side. Legs brown, with knees darkened; posterior femora and tibiæ whitish at the base, the latter with white bristles; tarsi with basal half of first joint white, remainder brown. Wings very short, clear, veins black.

Female much larger than the male. Thorax brown, indistinctly striped. Abdomen dark olive-brown.

This species agrees with *L. æstiva* in having very small short wings, but is distinguished from that species by the brown instead of bright orange femora, and by its smaller size. From the other Tasmanian species it is distinguished by its very small short wings and small size. It most closely resembles clear-winged specimens of *L. fumipennis*, but in case of doubt the small short wings distinguish it.

L. vernalis occurs somewhat sparingly amongst long grass or settled on low vegetation. My dates range from November 9 to January 12.

LEPTOGASTER FUMIPENNIS, White.

A large robust species. Thorax brown with, usually, three broad brown longitudinal stripes; abdomen black, with sides and segmentations grey; femora very dark brown; wings large, veins very conspicuous, and usually suffused with brown round the small cross-vein.

Length. Male, 12 mm.; female, 13 - 15 mm.

Length of wing. Female, 9 - 10 mm.

Hab. Generally distributed. (Also in Victoria and New South Wales).

Female. Face yellow or yellowish white; moustache white; back of head with a row of stiff black bristles. Antennæ black. Thorax brown, with, usually, three very broad, shining, dark brown stripes; sides grey; scutellum covered with grey tomentum. Abdomen unusually robust, olive-black, with sides, shoulders of segments, and segmentations grey; first segment with, usually, four black bristles on each side, and a few white hairs. Legs dark brown, with knees black; posterior tibiæ whitish at base, with black and white bristles, which vary considerably in different individuals; tarsi black, the first joint with basal three-fourths yellowish. Wings large, veins very conspicuous, the region surrounding the small cross-vein usually suffused with brown.

Male is much rarer than the female. The few specimens that I have seen are considerably smaller in size, and have the wings smaller and more smoky in appearance.

Variation. Although this species has typically smoky wings, yet specimens may be met with in which the wings are perfectly clear; these may represent a distinct species, but I am unable to find any satisfactory distinction. Some specimens have the thorax unstriped. In Victoria I have taken a specimen, probably belonging to this species, which is only 11 mm. in length, has the thorax olive-brown, and the wings clear. From New South Wales, however, Dr. Ferguson has kindly sent me three specimens for examination, which are quite typical.

This species in typical specimens may be easily identified by the smoky wings and large robust size; in smaller specimens with clear wings, however, identification is not so easy, and it is necessary to rely on negative characters. From *L. geniculata* it may be distinguished by the unbanded hind femora; from *L. æstiva* by the dark brown instead of orange femora; from *L. vernalis* by the longer wings and larger size; and from *L. autumnalis* by the darker femora, lighter thorax and abdomen, and larger size.

L. fumipennis occurs commonly in the bush, and seems to be generally distributed. The female is the sex usually met with. My dates range from November 18 to January 18.

LEPTOGASTER AUTUMNALIS. Sp. nov.

Face, front, back of head, thorax and abdomen black, without any sign of lighter colouration; femora and tibiæ fawn-colour, with knees black, the posterior femora with a

black longitudinal stripe, extending from the base to the apex, on each side; wings of medium length and always clear.

Length. Female, 10 mm.

Length of wing. Female, 7 mm.

Female. Face, front, and antennæ black. Moustache white, scanty. Back of head, thorax, and abdomen black, without any sign of lighter colouration. Legs with femora and tibiæ fawn-coloured, the posterior femora with a black longitudinal stripe on each side, extending from the base to the apex, that on the outer side being the broader. (In *L. geniculata* the dark marking on the hind femora consists of a circular band or ring.) Posterior tibiæ not conspicuously paler at the base; tarsi with first joint white, remaining joints brown, with apices of all joints black. Wings of medium length, always perfectly clear; halteres dull brown.

This species may be recognised without much difficulty by its uniform black colouration. It is an insect of the late summer and autumn, and probably does not appear on the wing until the other species of *Leptogaster* are over. I have only met with it in the bush at Bagdad, where it frequents low vegetation. My dates range from February 13 to March 2.

Subfamily Dasypogoninæ.

This subfamily is numerously represented on the mainland of Australia, but in Tasmania only five genera are known to occur. In all these genera the marginal cell of the wings is completely open.

Table of the Tasmanian Genera of Dasypogoninæ.

- 1 Abdomen constricted at the base; antennæ with
no very distinct terminal style. 2

Abdomen not constricted at the base; antennæ
with a distinct terminal style. 4

2. Small humpbacked species with bright red thorax.

CABASA, Macq.

Larger species, not humpbacked, and thorax not red 3

3. Antennæ about the same length as head, the third
joint hardly broadened.

BRACHYRRHOPALA, Macq.

Antennæ four times the length of head, the third
joint conspicuously broadened.

ERYTHROPOGON, White.

4. Fourth posterior cell closed at some distance above the wing margin; wings very short.

BATHYPOGON, Loew.

Fourth posterior cell open; wings long.

STENOPOGON, Loew.

28. CABASA, Walk.

Small, humpbacked species, with red thorax, and wings partly or altogether black.

Antennæ a little longer than the head, the first joint rather longer than the second, the third strap-shaped, about twice the length of the first two joints together, and terminating bluntly without any style or arista. Thorax extremely gibbous. Abdomen a little constricted at the base. Legs rather slender, with a few thin bristles. Wings large, the four posterior cells all wide open.

Table of the Tasmanian Species of Cabasa.

- | | |
|--|--------------------|
| 1. Thorax red; abdomen violet-black or greenish-black. | 2 |
| 2. Wings entirely black. | PULCHELLA, Macq. |
| Wings with basal half black, apical half hyaline. | RUBRITHORAX, Macq. |

CABASA PULCHELLA, Macq.

Syn. *Cabasa rufithorax*, Walk.

Thorax red; abdomen violet-black or greenish-black; wings entirely brownish-black.

Length. Male and female, 6 - 9 mm.

Hab. Generally distributed. (Also in Victoria and Queensland.)

Male and Female. Face black, with white tomentum at sides. Moustache, antennæ and front black. Thorax red, with a black anterior dorsal stripe, and small black spots on shoulders and at base of wings; scutellum black. Abdomen violet-black or greenish-black, with segmentations marked at the sides with white. Legs black. Wings entirely brownish-black.

This species may be easily recognised by its hump-backed shape, red thorax, and wholly black wings. It is not common, but seems to be widely distributed in the Tasmanian bush. My dates range from January 11 to February 15.

CABASA RUBRITHORAX, Macq.

Syn. *Dasypogon venno*, Walk.

Thorax red; abdomen violet-black or greenish-black; wings with basal half black, apical half hyaline.

Length. Male, 6 mm.

Hab. Bagdad.

Male. Face and front black, with grey tomentum; moustache yellowish. Thorax red, with a black anterior dorsal stripe, and small black spots on shoulders and at base of wings; scutellum black. Abdomen violet-black or greenish-black, with a little white pubescence at sides. Legs black. Wings with the basal half brownish-black, the apical half hyaline.

This species is at once distinguished from *C. pulchella* by the wings having only the basal half black, instead of being entirely black.

C. rubrithorax appears to be generally rare. I have personally only come across a single specimen, which occurred in the bush at Bagdad on February 13, 1913.

29. BRACHYRRHOPALA, Macq.

Antennæ about the same length or a little longer than the head; abdomen club-shaped; wings either hyaline or partly brown or black; anterior tibiæ with a terminal curved spine.

Antennæ with the first joint rather longer than the second, the third slightly longer than the first two joints together, and provided with a very small style. Thorax not gibbous (which distinguishes the genus from *Cabasa*) and without a stout spine on each side (which distinguishes it from *Chrysopogon*). Abdomen club-shaped, but differing much in shape in the different species. Legs with scattered bristles, the anterior tibiæ with a terminal curved spine, which is sometimes obscure. Wings with the four posterior cells and anal cell open, either hyaline, or more generally with brown or black markings.

Of this genus seven or eight species are known to occur in the Australian region, four of which are found in Tasmania.

Table of the Tasmanian Species of Brachyrrhopala.

1. Wings clear; abdomen and legs red. NITIDUS, Macq.
Wings partly brown. 2
2. Wings brown on fore border, remainder hyaline.
LIMBIPENNIS, Macq.
Wings brownish, hyaline in centre.
FENESTRATA, Macq.
Wings with basal half brown, apical half hyaline.
RUFICORNIS, Macq.

BRACHYRRHOPALA NITIDUS, Macq.

Wings clear; thorax black; abdomen and legs red.

Length. Male and female, 14-18 mm.

Hab. Bagdad Valley; Mount Arthur.

Male and female. Face covered with bright yellow tomentum; moustache consisting of a few long, yellow, bristle-like hairs. Antennæ red. Thorax black, the sides yellow, with yellow bristles. Abdomen dark reddish, unusually slender, and hardly club-shaped. Legs entirely red, with pale red bristles. Wings large, hyaline, with a yellow tinge towards the costal margin.

This species may be met with in March, flying in the bright sunshine with great rapidity, but seems to be generally uncommon.

BRACHYRRHOPALA LIMBIPENNIS, Macq.

Syn. *Brachyrrhopala maculinervis*, Macq.

Dioctria tasmanicæ, Walk.

Wings with fore border dark brown, remainder hyaline; thorax black; abdomen reddish-black; legs red or black, the base of tibiæ usually yellow. A variable species, both as regards size and colouration.

Length. Male and female, 12-20 mm.

Hab. Generally distributed. (Also in Victoria and Queensland.)

Male and female. Face covered with yellow tomentum, and bearing two black stripes, which are joined above. Moustache rather bushy, yellow. Antennæ reddish-black, the third joint usually the darkest. Front and thorax black. Abdomen reddish-black, the third and fourth segments with narrow pale yellow hind margins. Legs with femora and tibiæ reddish-black, the tibiæ usually with the base yellow; tarsi red or black; bristles of legs black. Wings large, the fore border deep brown, carried down centrally (at the base of the discal cell) in the form of a black spot; remainder of wing hyaline.

Variation. An unusually small male taken at Mangalore on October 18, 1914, has a rounded black spot on the face, instead of two black stripes, third joint of antennæ light red, and legs light red with femora black below.

This species is easily recognised by the dark fore border of the wings. It may be met with commonly frequenting flowers in the bush, and seems to be generally distributed. My dates range from October 18 to December 26.

BRACHYRRHOPALA FENESTRATA, Macq.

Syn. *Codula fenestrata*, Macq.

Brachyrrhopala victoriæ, Röder.

Wings brown, with a hyaline spot in centre, thorax black; scutellum red; abdomen a rounded club-shape,

black, with yellow bands on the second, third, sixth, and seventh segments.

Length. Male and female, 10 mm.

Hab. Generally distributed. (Also in Victoria.)

Male and female. Face black, with yellowish-grey tomentum at sides; moustache yellow. Antennæ red. Front black. Thorax considerably arched, brownish-black, with long white hairs; scutellum red. Abdomen short, a rounded club-shape (instead of a lengthened club-shape as in *B. nitidus* and *B. limbipennis*), black, with yellow bands on posterior margins of the second, third, sixth, and seventh segments. Legs with femora black on basal half, red on apical half; tibiæ red, with apex black; tarsi black; femora and tibiæ with a few small black and red bristles. Wings short, brown, darkest along the costal margin, the discal cell and basal half of first posterior cell hyaline.

This species may be easily recognised by the brownish wings, with a hyaline spot in centre, and the short abdomen of a rounded club-shape. It seems to be generally distributed in the Tasmanian bush, but is not common. My dates range from January 4 to March 3.

B. fenestrata differs so much from *B. nitidus* and *B. limbipennis* in the shape of the abdomen and much shorter wings that it might well be made the type of a new genus. It seems to be nearly allied to the genus *Codula*, but differs in having a curved terminal spine on the anterior tibiæ; this character, however, in some specimens is difficult to make out, and I am somewhat doubtful of its value as a generic character.

BRACHYRRHOPALA RUFICORNIS, Macq.

This species is unknown to me, and I take the following particulars from Miss Ricardo's description.

Wings with the basal half brown, apical half hyaline; thorax and abdomen black, the latter with yellow bands; antennæ and legs red.

Length, 6mm.

Hab. Tasmania and Queensland.

Face black, with white tomentum; moustache white. Front black. Antennæ red, a little brown at the apex. Thorax black, with scanty yellow tomentum; scutellum testaceous. Abdomen black, with yellow bands. Legs red, the anterior half of posterior femora and base of intermediate pair black; anterior tarsi black. Wings with basal half reddish-brown, apical half hyaline.

30. *ERYTHROPOGON*, White. (Fig. 26.)

Antennæ about four times the length of the head, the third joint conspicuously broadened; abdomen long and club-shaped, much constricted towards the base; wings large, with all the posterior cells and the anal cell open.

Face long and flat, descending in a straight line from the antennæ to the moustache, the latter very small, and confined to the oral margin. Antennæ placed extremely high, projecting horizontally forwards in a line with the vertex, about four times the length of the head, the first joint twice the length of the second, the third three times the length of the first and second together, much broader than either of them, and terminated by a rounded tip, which seems somewhat separated from the rest of the joint, although it does not form a distinct style. Thorax with shoulders produced into prominent tubercles. Abdomen long and club-shaped, much constricted towards the base. Legs with femora practically bare; tibiæ with a few bristles, the anterior pair with a small and inconspicuous apical curved spine. Wings large, with all the posterior cells and anal cell open.

This genus is nearly allied to *Brachyrrhopala*, but is distinguished by the very much longer antennæ. Only one species is at present known.

ERYTHROPOGON ICHNEUMONIFORMIS, White. (Fig. 26.)

Thorax black; abdomen with basal half red, apical half reddish-black, fourth segment with a white tomentose spot on either side; legs yellowish-red; antennæ with the first two joints red, third black.

Length. Male, 15 mm.; female, 13 - 17 mm.

Hab. Southern and northern Tasmania, also in Victoria.

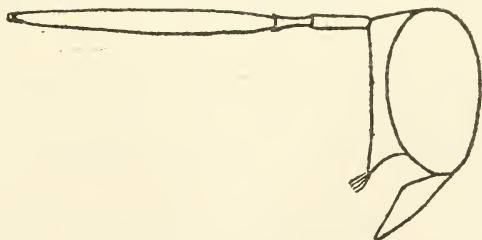


Fig. 26. Head of *Erythropogon ichneumoniformis*.

Male. Face red-brown, with a few scattered white hairs; moustache composed of a few pale golden bristles. Front black. Antennæ with the first two joints red, third black. Thorax black, without bristles, but with a

little white pubescence at sides, especially posteriorly; scutellum red-brown without either bristles or pubescence. Abdomen with the three first segments red, remaining segments reddish-black. Legs yellowish-red, the posterior pair slightly the darkest; posterior tibiæ with white bristles. Wings yellow-brown, with all the posterior cells and anal cell open, though the fourth posterior is slightly, and the anal considerably, contracted on the wing margin.

Female resembles the male very closely, but the thorax is slightly browner, and the fourth abdominal segment bears a white tomentose spot on each side.

Variation. A male bred by Mr. Spry from material obtained at Fern Tree Gully, Victoria, is only 11 mm. in length, and has the wings with basal two-thirds bright golden yellow, apical third hyaline.

E. ichneumoniformis is widely distributed in the Tasmanian bush, where it may be found resting on low vegetation, but it is by no means a common species. My dates range from February 9 to March 3.

31. BATHYPOGON, Loew. (Fig. 27.)

Abdomen longer than the wings, not constricted at the base; wings very short, the fourth posterior cell closed at some distance above the wing margin, the vein closing it almost in a line with that closing the discal cell.

Face with a large centre tubercle, which is covered with a large bushy moustache, reaching almost to the antennæ. Antennæ a little longer than the head, the first joint about twice the length of the second, the third about twice the length of the first and second together, and terminated by a distinct pointed style. Thorax rather long, very bristly posteriorly; scutellum with marginal bristles. Abdomen long and fairly stout, not in the least club-shaped or in any way constricted at the base, the sides either bare or with short bristly hairs; genitalia of male large and prominent. Legs stout and bearing long bristles. Wings remarkably short; the fourth posterior cell closed at some distance above the wing margin, the vein closing it almost in a line with that closing the discal cell; the other posterior cells open; anal cell closed.

The species belonging to this genus occur settled on the ground in dry situations. I have noticed a specimen of *B. brachypterus* having as its prey a moth as long as itself. In Tasmania two species are known to occur.

Table of the Tasmanian Species of Bathypogon.

1. Moustache yellow; antennæ entirely black; bristles of thorax, scutellum, and tibiæ yellow.

BRACHYPTERUS, Macq.

2. Moustache white; first joint of antennæ red; bristles of thorax, scutellum, and tibiæ black. (A blacker and more slender species.)

NIGRINUS, Ricardo.

BATHYPOGON BRACHYPTERUS, Macq.

Moustache yellow; antennæ entirely black; thorax deep brown, whitish at sides; abdomen deep brown, with bright golden-yellow pubescence; femora black above, red beneath; tibiæ black or red; bristles of thorax, scutellum, and tibiæ, yellow.

Length. Male and female, 18-20 mm.

Hab. Mangalore. (Probably generally distributed.)

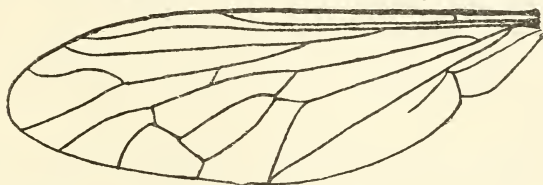


Fig 27. Wing of *Bathypogon brachypterus*.

Male and female. Face and front yellowish-grey; moustache either wholly yellow or black above and yellow below. Antennæ black. Thorax deep brown, with one broad or two narrow anterior dark brown stripes; sides and two short posterior stripes yellowish-white; posterior bristles long, yellow; bristles of scutellum yellow. Abdomen deep brown, with golden-yellow pubescence, which is longest on the posterior outer margins of each segment. Legs with femora black above, red beneath, covered with dense, long, yellowish-white hairs; tibiæ red or black, covered with yellowish pubescence, and bearing long yellow bristles. Wings varying in tint from light grey to yellow-brown.

This species somewhat resembles *B. nigrinus*, but is a more robust and more brightly coloured species; the moustache is bright yellow instead of white, and the bristles on the thorax, scutellum, and tibiæ are yellow instead of black.

B. brachypterus occurs commonly at Mangalore, and though apparently local, is probably widely distributed in Tasmania. It also occurs in Victoria, New South Wales,

and Queensland. My dates range from January 4 to February 15.

BATHYPOGON NIGRINUS, Ricardo.

Moustache white, with a few black bristles above; antennæ with first joint red, second and third black; thorax deep brown, white at sides; abdomen brownish-black; femora black above, red beneath; tibiæ reddish; bristles of thorax, scutellum, and tibiæ black.

Length. Male and female, 13 - 18 mm.

Hab. Mangalore.

Male and female. Face reddish, covered with white tomentum; front brown. Antennæ with first joint red, second and third black. Thorax deep brown, indistinctly striped, the sides white; bristles and bristles of scutellum black. Abdomen brownish-black, almost bare, but with a little depressed yellowish-white pubescence. Legs with femora black above, red beneath, bearing sparse white pubescence; anterior tibiæ red, posterior black, bristles black, but with a few white bristles at extreme apex; tarsi black. Wings hyaline or tinged with brown, particularly at apex.

Variation. Tasmanian specimens show little variation, but a female from Victoria has the tibiæ yellow-brown.

This is a more slender and generally blacker species than *B. brachypterus*. It may be recognised at once by the bristles of the thorax, scutellum, and tibiæ being black instead of yellow, and by the first antennal joint being red instead of black.

B. nigrinus may be met with settled on the ground in sandy places. It occurs sparingly during the month of January.

32. *STENOPOGON*, Loew.

(*Gonioscelis*, Schin.)

Face very narrow; abdomen much elongated, but not constricted at the base; wings large, the fourth posterior cell open.

Face very narrow, the narrowest part being at the base of the antennæ; moustache long and bushy. Antennæ a little longer than the head, the first joint about twice the length of the second, the third about equal in length to the first two together, and provided with a short blunt style. Thorax long and hairy, with lateral and posterior bristles; scutellum with weak marginal bristles. Abdomen greatly elongated, and, in dried specimens, much compressed laterally, but not constricted at the base. Legs

powerful; femora and tibiæ with numerous strong bristles. Wings large and broad, either hyaline or tinted with brown or yellow, but without any definite markings; first posterior cell (in Australian species) wide open; fourth posterior cell open, but constricted on the wing margin; anal cell closed on the wing margin or very slightly open.

The species belonging to this genus, like those of *Bathypogon*, are strong, predaceous insects; their habits, however, are somewhat different, as, instead of settling on the ground, they frequent low vegetation. I have noticed a specimen of *S. elongatus* having as its prey a specimen of the March Fly, *Tabanus microdonta*.

Stenopogon is represented in Tasmania by the single species *S. elongatus*, which also occurs commonly on the Australian mainland.

STENOPOGON ELONGATUS, Macq.

Syn. *Dasypogon flavifacies*, Macq.

D. digentia, Walk.

D. lanatus, Walk.

D. thalpius, Walk.

D. agave, Walk.

Stenopogon fraternus, Bigot.

The above synonymy is given on the authority of Miss Ricardo, who has examined both Walker's and Macquart's types.

Moustache bright yellow; thorax black, with yellow tomentum at sides; abdomen black, with yellow side stripes; femora red and black or yellow and black; tibiæ red or yellow; tarsi black; bristles of femora, tibiæ, and tarsi black; wings hyaline or tinged with brown.

Length. Male, 17-23 mm.; female, 20-25 mm.

Hab. Generally distributed. (Also in Victoria, New South Wales, Queensland, and Western Australia.)

Male and female. Face yellow; moustache bright yellow; beard pale yellow. Antennæ black, the first two joints with long black hairs. Front black; back of head with long black hairs. Thorax black, with yellow tomentum on shoulders and at sides; dorsum bearing dense black hairs; bristles at sides yellow; scutellum with a number of weak black marginal bristles. Abdomen black, shining, with yellow side stripes and pale yellow pubescence. Legs with femora red and black, or yellow and black, the anterior pair with basal two-thirds black, middle pair with basal third black, posterior pair with basal half black, remaining portions of all femora red or

yellow; knees black; tibiæ varying in colour from light yellow to red; tarsi black; bristles of femora, tibiæ, and tarsi black, although a few yellow bristles may sometimes be present. Wings hyaline or tinged with brown; fourth posterior cell open, but contracted at the wing margin to about half its breadth; anal cell almost, but not quite, closed.

Variation. A female taken at Bellerive differs considerably from the type; the femora are entirely black, the bristles of the femora yellow, of the tibiæ and tarsi red, moustache pale yellow, and tomentum on thorax, and abdominal side-stripes, white. This specimen may possibly represent a distinct species, but I think that it is probably only a variety of *S. elongatus*.

S. elongatus is a common insect, and seems to be distributed over almost the whole of Australia. It may usually be met with settled on low vegetation. My dates range from January 1 to February 13.

Besides the foregoing, the two following species, *Dasygogon albonotatus*, Macq., and *Dasygogon nigrinus*, Macq., originally described from Tasmania, are stated by Miss Ricardo to be of doubtful position. *D. albonotatus* is described as having a long, slender, black abdomen, with white spots at sides of second to fifth segments; legs red, wings hyaline, a little yellowish at base and on fore border. Length, 16 mm. *D. nigrinus* is described as black, the fifth and sixth abdominal segments with testaceous segmentations; legs red and black; wings dark brown, with base hyaline. Length, 10 mm.

Subfamily Laphrinæ.

Of this subfamily eight genera have been recorded from the Australian region, but of these only one, *Laphria*, is known to occur in Tasmania.

33. LAPHRIA, Meig.

Large robust flies, usually shining blue-black or violet in colour. Moustache large and bushy, and not confined to the oral opening; legs strong and hairy; anterior tibiæ without a curved spine at apex; wings with first posterior cell open, fourth posterior cell closed at some distance above the wing margin, anal cell closed close to the wing margin.

Face with a distinct facial knob; moustache large and bushy. Antennæ rather longer than the head, first joint about three times the length of the second, third joint a little longer than the first and second together, and, in

Australian species, somewhat expanded, but differing in shape in each species. Thorax with dense pubescence, scutellum with long marginal hairs. Abdomen either long, narrow, and almost parallel-sided, or else broad, and ovate, with dense lateral pubescence, but with no distinct side bristles except in one mainland species (*L. clavata*, White.) Legs strong and very hairy; femora frequently thickened, and hind tibiæ conspicuously bowed. Wings either hyaline, brown, or grey, but without any distinct markings; first posterior cell open, fourth closed at some distance above wing margin, anal cell closed close to the wing margin.

The species belonging to this genus occur in the bush, where they may be found settled on logs or on the leaves of shrubs. Three species have been described from Tasmania, but of one of these (*L. niveifacies*) no specimen seems to be known.

Table of the Tasmanian Species of Laphria.

1. Colouring of abdomen and tibiæ blue-black or violet according to the angle of light. 2
- 2 Femora entirely violet. NIVEIFACIES, Macq.
Anterior and middle femora violet, posterior femora with basal half orange, apical half violet.
TELECLES, Walk.
- All femora with basal two-thirds orange, apical third violet. RUFIFEMORATA, Macq.

LAPHRIA TELECLES, Walk.

Abdomen narrow and almost parallel-sided; colouring of thorax, abdomen, and tibiæ shining blue-black or violet; anterior and middle femora, and apical half of posterior femora, blue-black or violet, basal half of posterior femora bright orange.

Length. (Tasmanian specimens.) Male, 14-18 mm.; female 12 mm.

Hab. Mangalore. (Probably generally distributed.) Also in Victoria, New South Wales, and Western Australia.

Male. Face covered with white hairs, except at the facial tubercle, which bears a dense, bushy moustache of long black hairs; beard white. Front black, with long black hairs bordering the eyes on either side. Antennæ black, the first two joints bearing long black hairs. Thorax shining blue-black or violet, with white or pale yellow shoulder-spots. Abdomen almost parallel-sided, blue-black or violet, with soft white or yellow side-pubescence,

and white side-spots on the posterior angles of the second to fifth segments; genitalia large, black, and bearing long black hairs. Legs stout, with dense, long, black pubescence, the posterior femora swollen, and posterior tibiæ curved; anterior and middle femora, and apical half of posterior femora, blue-black or violet, basal half of posterior femora orange; all tibiæ blue-black or violet; tarsi black. Wings brown, but with the base more or less clear.

Female resembles the male very closely, but the wings are hyaline.

This species may be easily distinguished from *L. rufifemorata* by having only the posterior, instead of all the, femora, partly orange, and by the narrower abdomen.

L. telecles occurs not uncommonly in the bush, usually settled on dead wood near the ground, but sometimes on tree-trunks. My dates range from December 17 to March 1.

LAPHRIA RUFIFEMORATA, Macq.

Abdomen broad, flattened, and somewhat ovate; thorax dull black; abdomen, tibiæ, and apical third of all femora shining blue-black or violet, basal two-thirds of all femora orange.

Length. (Tasmanian specimens.) Female, 14-18 mm.

Hab. Bagdad Valley. (Probably generally distributed.) Also in New South Wales and Western Australia.

Female. Face black, covered at sides with white or yellow pubescence; facial tubercle black, bearing a bushy black moustache; beard white. Front black, with long black hairs bordering the eyes on either side. Antennæ black, the third joint expanded. Back of head with long black hairs jutting out on each side beyond the eyes. Thorax dull black, with two faint grey median stripes and yellowish-white shoulder-spots; scutellum with a fringe of remarkably long yellow hairs. Abdomen broad, flattened, and somewhat ovate, shining blue-black or violet, with pale yellow side-pubescence, and yellowish-white side-spots on posterior angles of second to fifth segments, that on the fifth segment being very small and inconspicuous. Legs stout and bearing very long pubescence, which is black on the black portions, orange on the orange portions, tibiæ curved, and without any distinct bristles; all femora with basal two-thirds bright orange, apical third blue-black or violet; tibiæ blue-black or violet; tarsi black. Wings with veins suffused broadly with brown.

All the specimens of *L. rufifemorata* that I have met

with are females, so I am unable to give a description of the male. The females occur not uncommonly in the bush on high ground; they may be found settled on logs or on the leaves of shrubs. My dates range from January 18 to February 13.

LAPHRIA NIVEIFACIES, Macq.

Thorax and abdomen violet-black, with blue, violet, and green reflections, legs violet, wings half brown.

Length. Female, 8 mm.

Hab. "Tasmania."

This species is quite unknown to me, and Miss Ricardo states that the type appears to be lost. Should any specimens come to hand they should be easily distinguished by the wholly violet legs.

Subfamily Asilinae.

Of this subfamily five genera have been recorded from Tasmania, whilst another—*Dysmachus*—is now added.

Table of the Tasmanian Genera of Asilinae

- | | |
|---------------------------------|-----------------|
| 1. Style of antennæ feathered. | OMMATIUS, Wied. |
| Style of antennæ not feathered. | 2 |

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| 2. Wings with three submarginal cells. | PROMACHUS, Loew. |
| Wings with only two submarginal cells. | 3 |

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| 3. Lower branch of cubital fork ending in or above the wing-tip; ovipositor with a conspicuous circle of spines. | PROCTACANTHUS, Macq. |
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Lower branch of cubital fork ending well below the wing-tip.	4
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| 4. Thorax with long bristles from front to back. | DYSMACHUS, Loew. |
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Thorax with short bristles anteriorly, long posteriorly.	5
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| 5. Ovipositor very long and laterally compressed. | NEOITAMUS, Ost-Sack. |
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Ovipositor short and conical.	ASILUS, L.
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34. OMMATIUS, Wied.

Antennæ feathered; face with a tubercle; costal margin of wings frequently inflated in the male; ovipositor small and inconspicuous and not laterally compressed.

Head distinctly broader than the thorax; face with a tubercle; moustache either scanty or bushy, frequently covering the greater part of the face. Antennæ with all

three joints short, the third bearing a feathered aristiform style, which is quite twice the length of the three antennal joints together. Thorax almost bare anteriorly, but with long hairlike bristles posteriorly. Abdomen narrow and almost parallel-sided, the sides either bare or with short bristles; genitalia of male large and prominent; ovipositor small and not laterally compressed. Legs either long or of medium length, furnished with weak bristles. Wings with a normal venation; costal margin in the male either simple or inflated, and wings in both sexes sometimes rilled anteriorly; cubital fork long and embracing the wing-tip.

Some of the smaller species belonging to this genus are difficult to identify. In cases of doubt some assistance will be afforded by noticing the bristles of the scutellum, which in some species are only two in number, whilst in others they form a complete fringe.

Table of the Tasmanian Species of Ommatius.

1. Wings from the middle to the tip brown, the base and posterior margin hyaline. LEVIS, Sp. nov.
Wings entirely hyaline. 2
2. Legs largely reddish-yellow; wings without any inflation in either sex; bare species.
DIMIDIATUS, Macq.
Legs black; wings slightly inflated in male; hairy species. PILOSUS, Sp. nov.

OMMATIUS DIMIDIATUS, Macq.

Some doubt attaches to the identification of this species. Miss Ricardo states that the type appears to be lost, so our only means of identification is Macquart's description. The type, a female, was from Tasmania. In Tasmania I have not met with any specimen agreeing with Macquart's description, but from New South Wales, Dr. Ferguson has kindly sent me four specimens for examination which agree with the description fairly well. I therefore propose to describe these specimens here, under Macquart's name of *dimidiatus*.

Abdomen and thorax black, with grey or brown tomentum, and whitish shoulder-spots; femora and tibiae reddish-yellow, the former with black stripes or spots above, which vary greatly in extent in different specimens; wings entirely hyaline, and without any sign of inflation in either sex.

Length. Male, 9 mm.; female, 7 mm.

Hab. Described from Tasmania, but at present only known to occur in New South Wales.

Male. Face pale brown. Moustache scanty, consisting of snow-white hairs, with about six isolated black hairs above; beard white. Antennæ black. Front brown. Thorax black, with brown tomentum and whitish shoulder-spots; anterior half bare, posterior half with a few black bristles; scutellum almost bare, but with two very weak marginal black bristles. Abdomen black, with grey tomentum, almost bare, but with short white side-bristles on posterior margins of each segment; genitalia orange or black. Legs with femora reddish-yellow, with a black stripe above, that on the posterior pair sometimes reduced to an elongated spot, but the shape and extent of these black markings subject to great variation; tibiæ reddish-yellow, with apex black; tarsi with first joint yellow, remaining joints black; the femora are almost bare, but have weak white bristles below, and one or two black ones near the apex above; tibiæ with a few scattered black, and one or two white, bristles. Wings entirely hyaline, rilled, but without any sign of inflation.

Female resembles the male very closely, but is rather more robust in shape, and the legs may be a little darker.

This species is readily recognised by the colouring of the legs, which, even in dark specimens, have at least the lower half of the femora, and a large part of the tibiæ, reddish yellow; by its small size, and hyaline wings without any sign of inflation in either sex. As stated above, its occurrence in Tasmania is still open to some doubt.

OMMATIUS PILOSUS, Sp. nov.

A very hairy species. Thorax and abdomen black, the latter with grey segmentations; legs black with reddish knees; anterior and middle tibiæ with long white hairs, the middle tibiæ also bearing extremely long black hairs, and hair-like bristles, on the inner side; wings hyaline, slightly inflated in the male.

Length. Male, 11 mm.; female, 10.5 mm.

Hab. Mangalore. (Also in South Australia.)

Male. Face black, covered with grey tomentum; moustache bushy, black above, yellow below. Front black, with yellowish tomentum. Antennæ black. Thorax black, indistinctly striped, with grey tomentum on shoulders and at sides, the whole bearing stiff black hairs, which are short anteriorly, long posteriorly; scutellum black, fringed with numerous very long, weak, white, upturned bristles. Abdomen black, with grey segmentations, the sides with dense white pubescence. Legs black, with the knees reddish, both femora and tibiæ sometimes appearing a little

reddish beneath; anterior coxæ with a pencil of stiff black bristles; all femora with abundant long white pubescence, the posterior pair with a few black bristles below; anterior and middle tibiæ with long white pubescence, the middle tibiæ also bearing extremely long black hairs, and hair-like bristles, on the inner side; posterior tibiæ with black bristles; tarsi black, with black bristles, which are particularly long on the anterior and middle pairs; the front tarsi also bear abundant white pubescence. Wings entirely hyaline, rilled, and with the costal margin slightly inflated.

Female resembles the male, but differs in having the moustache black and white, instead of black and yellow, the reddish colour of the knees slightly extended on the hind tibiæ, and wings with costal margin not inflated.

This species may be distinguished from *O. dimidiatus* by its black, instead of reddish-yellow, legs, and by its more hairy body and legs; from *O. levis* by its hyaline wings. Of the various described mainland species, the only one with which it could be confused is *O. queenslandi*, *Ricardo*, from which it is distinguished by the slightly inflated wings in the male, and by the wholly black tibiæ. The other mainland species are all very much larger insects.

O. pilosus occurs sparingly in the bush, where it may be found settled on the dead twigs of small trees. Time of occurrence, January. I have also taken a specimen at Aldgate, South Australia.

OMMATIUS LEVIS, Sp. nov.

Thorax, abdomen, and legs black; wings with basal half hyaline, apical half brown with hyaline hind-margin, and not inflated in either sex.

Length. Male, 11 mm.

Hab. Launceston.

Male. Face black; moustache of long white hairs, with a few black ones above, two of these being extremely long. Front black. Antennæ brownish-black. Thorax black, with a little grey tomentum on shoulders and at sides, the whole covered sparingly with black bristles, which are very short anteriorly, long posteriorly; scutellum black, fringed with numerous weak white bristles. Abdomen black, with white hairs at sides. Legs black, the tibiæ tinged with rusty brown; femora with white pubescence; tibiæ with white and black bristles; tarsi with black bristles. Wings with basal half hyaline, apical half brown with hyaline hind-margin; the wings are rilled but not inflated.

This species is distinguished from all the other Australian species of *Ommatius* by having the wings partly brown and partly hyaline. Only a single specimen is at present known; it was taken by Mr. Hardy at Launceston on January 25, 1914.

35. *PROMACHUS*, Loew.

(*Bactria*, Meig. *Telejoneura*, Rond. *Trupanea*, Macq.)

Abdomen conical, somewhat hairy, and longer than the wings; legs rather strong but not stout; claws of tarsi pointed; ovipositor without a circlet of spines; wings with three submarginal cells, the veinlet dividing the second and third submarginal cells situated directly above the second posterior cell; first posterior cell closed or open; fourth posterior and anal cells closed.

The only other Australian genus having three submarginal cells is *Philodicus*, Walk., in which the veinlet dividing the second submarginal (or cubital fork) cell and the third submarginal cell is situated directly above the discal cell, so that whereas in *Promachus* the second submarginal cell is much shorter than the third, in *Philodicus* the reverse of this is the case.

One species of *Promachus* was described by Macquart from Tasmania, but no specimen seems now to be known.

PROMACHUS TASMANENSIS, Macq.

This species was described as ashy-grey; abdomen with dorsal black spots; moustache yellow; antennæ and legs black; tibiæ testaceous.

Length. Male, 20 mm.

Hab. "Tasmania."

36. *PROCTACANTHUS*, Macq.

(*Acanthodelphia*, Bigot.)

Wings with the lower branch of the cubital fork curving upwards and ending in or above the wing-tip; upper branch often with a recurrent bend or rudimentary veinlet; first posterior cell wide open; fourth posterior and anal cells closed. Abdomen conical and much longer than the wings; ovipositor with a conspicuous circlet of spines.

Of this genus two species have been described from the Australian region; one of these, *P. durvillei*, Macq., is given by Macquart as from New South Wales, but Miss Ricardo states that the type is from Tasmania.

PROCTACANTHUS DURVILLEI, Macq.

This species is described as having the thorax blackish, with yellow pubescence and three black stripes; abdomen shining black with blue reflections; femora black, tibiæ reddish, with reddish bristles.

Length. Female, 18 mm.

37. DYSMACHUS, Lw.

Thorax bearing long bristles from front to back; moustache large and bushy; abdomen with lateral bristles.

Face somewhat projecting; moustache large and bushy. Antennæ with the third joint usually elliptical, but in the Australian species elongated and almost linear. Thorax bearing long dense bristles from front to back; abdomen with lateral bristles; genitalia of male large; ovipositor of the female with the end lamellæ wedged-in. Legs stout, hairy and bristly, the bristles on the tibiæ unusually long. Wings with the normal venation of *Asilus*.

Dysmachus is represented in the Australian region by a single species, *D. rudis*, Walk., which does not seem quite typical of the genus.

DYSMACHUS RUDIS, Walk.

Thorax grey-brown, with two darker centre stripes; abdomen grey-brown, with hind-margins of segments white; legs black, with base of tibiæ and base of first tarsal joint reddish; wings brownish or hyaline.

Length. Male and female, 12 mm.

Hab. Mangalore. (Probably generally distributed.)

Male. Face grey; moustache large and bushy, reaching nearly to the antennæ, black, with a few white hairs below. Antennæ black, the first joint twice the length of the second, the third longer than the first two joints together, and bearing a thin style. Thorax grey-brown, with two darker centre-stripes, and suffused interrupted side-stripes, the whole bearing long black bristles, which descend mane-like to the front margin; scutellum with two long black terminal bristles. Abdomen grey-brown, with hind-margins of segments white, and black lateral bristles; genitalia black, large and prominent. Legs black, the base of tibiæ and of first tarsal joint reddish; all joints bearing black bristles, those on the tibiæ being especially long. Wings usually brownish, but sometimes hyaline.

Female resembles the male very closely, but the abdomen is produced into a laterally-flattened ovipositor, resembling that of *Neotamus*, though shorter than in most species of that genus.

D. rudis is a common species in the early springtime. It occurs settled on stones and in similar situations. My dates range from September 13 to November 9. It also occurs in Victoria and New South Wales.

38. NEOITAMUS, Ost-Sack.

(*Itamus*, Loew.)

Ovipositor very long and laterally compressed; bristly hairs of thorax short anteriorly, long posteriorly.

Head somewhat projecting; moustache bushy, but not nearly reaching to the antennæ. Antennæ slender, a little longer than the head, the first joint two or three times the length of the second, the third about equal to, or a little longer than, the first two together, cylindrical, and provided with a thin style. Thorax with short bristles anteriorly, long posteriorly; scutellum with two or four marginal bristles. Abdomen long and narrow, with or without weak side-bristles; genitalia of male large, and differing in shape in almost every species; ovipositor of female very long and laterally compressed, and apparently including the sixth and seventh abdominal segments. Legs of medium length, all joints bearing bristles. (In the Palæarctic species of this genus the tibiæ are extensively bright orange, but this is rarely the case with the Australian species.) Wings with the normal venation of *Asilus*, frequently rilled, but never inflated.

Neoitamus is one of the most difficult of the Australian genera. It contains a large number of closely-allied species, which can only be distinguished with difficulty, the difficulty being increased by the fact that the same species is liable to vary considerably according to the part of Australia in which it occurs. Of the seven known Tasmanian species two appear to be peculiar to the island, whilst the other five occur also on the Australian mainland.

Table of the Tasmanian Species of Neoitamus.

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| 1. Femora entirely black. | 2 |
| Femora black above, red, brown, or yellow beneath. (Small brownish species.) | 6 |
| 2. Tibiæ entirely black; abdominal segmentations yellow. | FLAVICINCTUS, White. |
| Tibiæ always partly red, brown, or yellow. | 3 |
| 3. Scutellum with four marginal bristles, which are usually yellow, but sometimes black; thorax with one broad median stripe; large species. | |

HYALIPENNIS, Ricardo.

Scutellum with only two marginal bristles.

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4. Wings suffused with brown at apex of second basal cell, at anterior cross-vein, and at base of cubital fork; bristles of abdomen black; moustache of female almost entirely white.

CALIGINOSUS, White.

Wings hyaline or evenly shaded; moustache of female largely black.

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5. Second posterior cell of wings broad and not contracted; front tibiæ largely red; bristles of abdomen white; ovipositor very long; summer species.

VULGATUS, White.

Second posterior cell of wings conspicuously contracted at a short distance from the wing-margin; front tibiæ blackish; abdomen practically bare; ovipositor unusually short; late autumn species.

ABDITUS, Sp. nov.

6. Thorax with one broad median stripe; posterior thoracic bristles white.

GRAMINIS, White.

Thorax with two median stripes; all thoracic bristles black.

BRUNNEUS, White.

Besides the above species, *N. fraternus*, Macq. has been described from Tasmania; this species I am unable to distinguish unless it is the same as *N. hyalipennis*, Ricardo, which in Tasmanian specimens frequently has the wings shaded with brown, and like *N. fraternus* has four scutellar bristles.

NEOITAMUS FLAVICINCTUS, White.

Thorax black with yellow stripes; abdomen black, with segmentations yellow, more distinct in female than in the male; legs jet-black; posterior tibiæ and first joint of posterior tarsi with short, thick, ruddy pubescence on their inner sides; wings tinged with brown, darkest towards the tips.

Length. Male, 13.5 mm.; female (including ovipositor), 15 mm.

Hab. Bagdad Valley.

Male. Face covered with golden tomentum. Front black. Moustache large and bushy, black. Antennæ black, the first and second joints with black bristles, the third joint scarcely longer than the first two together. Thorax with two black median stripes, divided by a thin yellow line, and bordered outwardly with yellow; sides of dorsum broadly black, bordered with yellow below; scutellum yellowish, with numerous long marginal black

and yellow hairs. Abdomen black, with segmentations yellow, and bearing yellow pubescence; genitalia large and prominent with black pubescence. Legs jet-black, with abundant black bristles and pubescence; posterior tibiæ and first joint of posterior tarsi with, in addition, short ruddy pubescence, which is especially conspicuous on the inner sides of the tibiæ. Wings brownish, darkest towards the tips.

Female resembles the male, but the abdomen is broader, and the yellow segmentations usually more distinct; ovipositor long and narrow.

N. flavicinctus is very distinct from any of the other Australian species; it can be recognised at once by its black and yellow colouring, and black legs. It is a scarce mountain species, occurring during the month of January.

NEOTAMUS HYALIPENNIS, Ricardo.

Thorax black and grey, with a broad black centre stripe, which is bordered with yellow-brown on each side; scutellum with four marginal bristles, which are usually yellow but sometimes black; abdomen black with hind-margins of segments pale grey; femora black; tibiæ orange-brown with apex black; wings hyaline or brownish.

Length. Male, 17 mm.; female, 23 mm.

Hab. Bagdad Valley. (Probably generally distributed).

Male. Face grey, with brown tomentum in middle; moustache bushy, black above, white below. Antennæ black, the first joint twice the length of the second, the third about equal in length to the first and second together. Thorax grey, with a broad black centre-stripe, bordered by yellow-brown, and broad black side-stripes; scutellum grey, with four marginal bristles, which are usually yellow, but sometimes black. Abdomen robust, black, with hind-margins of segments pale grey; sides of abdomen with abundant white pubescence and short white bristles. Legs with femora black; tibiæ orange-brown, with apex black; tarsi black, the first joint brown at the base; bristles of legs entirely black. Wings either hyaline or brown.

Female resembles the male, but the abdomen is produced into a long ovipositor, and is generally less hairy; the abdominal bristles are shorter, mostly white, but with also a few black ones.

N. hyalipennis is the largest known Australian species of the genus. It may be recognised readily by its large

size, four scutellar bristles, and single broad, black, median, thoracic stripe. It is a common species, and may be met with settled on the ground, on fences, and on tree-trunks. My dates range from November 9 to February 13. It occurs also in Victoria.

NEOITAMUS CALIGINOSUS, White.

Thorax black and brown; scutellum with two long terminal bristles, either both black or one black and one white; abdomen black, with hind-margins of segments white; femora black; tibiae red with apex black; wings hyaline, suffused with brown at apex of second basal cell, at anterior cross-vein, and at base of cubital fork.

Length. Male, 9 mm.; female, 10-14 mm.

Hab. Bagdad Valley; Bellerive.

Female. Face covered with grey tomentum; moustache white, with a few black hairs intermixed. Front black. Antennae black, the first two joints with long black hairs. Thorax with two median, narrowly-divided, brownish-black stripes, and two broad lateral stripes; sides of thorax light brown; scutellum brownish-grey, with two long terminal bristles, of which one is usually white and one black, but sometimes both are black. Abdomen black, with hind margins of segments white; sides of abdomen with black bristles. Legs with femora black; tibiae red with apex black, the hind pair darker than the others; first joint of tarsi and base of other joints red, remainder black; bristles of legs mostly black, but with usually a few white ones. Wings hyaline, with the apex of second basal cell, the anterior cross-vein, and base of the cubital fork (also sometimes the base of second posterior cell) suffused with brown. (To the naked eye this merely gives the impression of the veins being darkened in the areas specified, but examination with a low-power lens shows the presence of suffused portions of the wings). Second posterior cell short and broad, and not contracted.

The female shows the specific characters most clearly. The male is usually much smaller, the beard yellowish-white, with a few black hairs below, and the scutellar bristles are both black.

Tasmanian specimens of this species may be identified without much difficulty by the irregularly-suffused wings, the black abdominal bristles, and the almost wholly white moustache of the female. On the mainland of Australia, however, besides typical specimens, others occur having the wings quite hyaline, which renders identification more difficult.

N. caliginosus is a fairly common species; it may be met with settled on the ground or on tree-trunks. My dates range from October 20 to February 13. It also occurs commonly in New South Wales.

NEOITAMUS VULGATUS, White (Fig. 28).

Thorax black and grey or black and yellowish; scutellum with two long, black, terminal bristles; abdomen black with hind-margins of segments indistinctly grey; femora black; tibiae with basal half, or two-thirds, dark red; wings with the second posterior cell broad and not contracted.

Length. Male, 14 mm.; female (including ovipositor), 15.5 mm.

Hab. Bagdad Valley. (Probably generally distributed.)

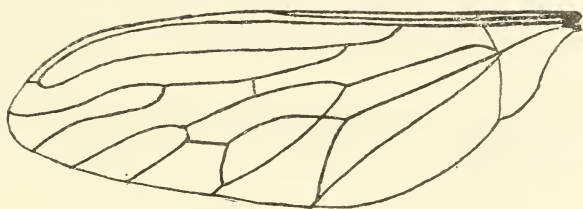


Fig. 28. Wing of *Neoitamus vulgatus*.

Male. Face covered with yellowish-grey tomentum. Moustache black above, white beneath. Front black, with a little light tomentum. Thorax with two black median stripes, divided by a yellowish line, bordered outwardly with yellowish-grey, and with two broad lateral black stripes, which are broken up by light cross-lines into four distinct patches, in this respect differing from *N. hyalipennis*, which has the side-stripes almost entire; bristles black; scutellum grey, with two long, black, terminal bristles. Abdomen black, with hind-margins of segments indistinctly grey. Legs with femora black; anterior and middle tibiae with basal two-thirds dark red, apical third black; posterior tibiae with basal half dark red, apical half black; anterior and middle tarsi with first joint two-thirds red, posterior tarsi with first joint only red at base; remaining tarsal joints black, with base of each reddish; bristles of legs mostly black, but with also a few white ones. Wings tinged with brown, the cubital fork narrow and contracted in the middle, the second posterior cell broad and not contracted.

Female, except for the broader abdomen, and long, laterally compressed ovipositor, resembles the male in all respects.

Variation. The above description refers to Tasmanian specimens, but from New South Wales I have received specimens in which the thorax bears one broad, instead of two narrow, median stripes. Such specimens can be distinguished from *N. hyalipennis* by the two scutellar bristles.

N. vulgatus resembles *N. hyalipennis*, *N. caliginosus*, and *N. abditus*. From *N. hyalipennis* it is distinguished by the scutellar bristles being only two instead of four in number, its smaller size, and by the coloured portions of the tibiæ being dark red instead of pale yellowish-red; from *N. caliginosus* by the evenly suffused wings, and the white instead of black abdominal bristles; from *N. abditus* by the different venation, the second posterior cell being broad and not contracted, and the cubital fork distinctly contracted in the middle and spread out as it reaches the wing-margin, also by the lighter colouring of the anterior tibiæ.

N. vulgatus occurs commonly in the bush, settled on logs or on fallen branches. My dates range from November 1 to January 18.

NEOITAMUS ABDITUS, Sp. nov. (Fig. 29).

Thorax grey or brown, with two dark brown centre-stripes; abdomen black, with hind-margins of segments grey; femora black; anterior tibiæ blackish, posterior tibiæ light yellow-brown; wings with the second posterior cell conspicuously contracted at a short distance from the wing-margin; cubital fork narrow and barely contracted in middle.

Length. Female, 11 - 12 mm.

Hab. Bagdad Valley.



Fig. 29. Wing of *Neoitamus abditus*.

Female. Face grey-brown; moustache black, with a few white hairs below. Antennæ black. Thorax grey or

grey-brown, with two very closely approximated dark brown median stripes, and indistinct side-stripes; bristles black; scutellum with two or four black marginal bristles. Abdomen black, with hind-margins of segments white, almost bare, but with a little white pubescence; ovipositor rather short. Legs with femora black; anterior tibiæ blackish; middle tibiæ yellow-brown with apex black; posterior tibiæ yellow-brown; tarsi yellow-brown, with tips of joints black; bristles on femora, tibiæ, and tarsi entirely black. Wings hyaline, the cubital fork long and narrow, and barely contracted in the middle; second posterior cell conspicuously contracted at a short distance from the wing-margin.

This species bears a close resemblance to both *N. caliginosus* and *N. vulgatus*, but can be distinguished by the venation, the second posterior cell being long and conspicuously contracted at a short distance from the wing-margin, instead of being short and broad and not contracted, and, on the other hand, by the cubital fork being longer and narrower and less contracted, also by the darker colouring of the anterior tibiæ.

N. abditus is a late autumn species. It may be met with not uncommonly settled on the ground or on fencing posts. My dates range from March 1 to April 26.

NEOITAMUS GRAMINIS, White.

Thorax yellow-brown, with one broad dorsal and two lateral brownish-black stripes; abdomen brownish-black, with conspicuous light yellow-brown segmentations; femora black above, red beneath; tibiæ light yellow-brown, with apex black; moustache entirely yellow; posterior thoracic bristles white.

Length. Male, 11.5 mm.; female, 12.5 mm.

Hab. Bagdad Valley.

Male. Face and front covered with pale yellow tomentum; moustache pale yellow, scanty, without any black bristles. Thorax yellow-brown, with a broad median and two lateral brownish-black stripes; sides bright yellow-brown; posterior bristles white; scutellum with two weak yellow terminal bristles. Abdomen brownish-black, with hind-margins of segments light yellow-brown, and bearing yellow lateral bristles. Legs with the femora broadly black above, red beneath; anterior and middle tibiæ red, with black bristles, posterior tibiæ yellow-brown with white bristles; apex of tibiæ and tarsi black. Wings tinged with brown.

Female resembles the male, but the legs are lighter, the tibiæ being all pale yellow-brown, with apex black, and the wings are hyaline.

Variation. Specimens from New South Wales, which Dr. Ferguson has kindly sent me, have the femora entirely black, except the extreme base, which is light reddish-brown, and the tibiæ are a light yellow-brown in both sexes; the thoracic bristles may be almost entirely white, or with only a few white ones posteriorly; and the abdomen is blacker than in Tasmanian specimens.

This species can be easily distinguished from *N. brunneus*, the only Tasmanian species that it resembles, by the white thoracic bristles, and by the thorax having one broad instead of two narrow median stripes.

N. graminis occurs sparingly on high ground, where it may be found resting on the stems of long grass, during the months of January and February.

NEOITAMUS BRUNNEUS, White.

A small brown species. Thorax light brown, with two dark median stripes, and black bristles; abdomen brown, with hind-margins of segments indistinctly paler; femora black above, light brown beneath; tibiæ light brown; moustache pale yellow, with a few black hairs above.

Length. Male, 12 mm.; female, 11 mm.

Hab. Mangalore. (Probably generally distributed.)

Male. Face covered with yellowish-white tomentum; moustache pale yellow, with a few black hairs above. Antennæ with the first joint red, remainder black. Thorax light brown, with two dark brown median stripes, and three brown suffused spots on either side; bristles entirely black; scutellum grey-brown, with two long, marginal, black bristles. Abdomen brown, with hind-margins of segments indistinctly paler; dorsum of abdomen with black, and sides with white, short stiff pubescence. Legs light brown, with upper surface of femora black, and apex of tibiæ, and last four tarsal joints, darkened; posterior femora with one long and about three short black bristles; all tibiæ with white and black bristles. Wings very slightly tinged with brown; anterior veins brown, posterior veins black.

Female resembles the male very closely, but the thorax is somewhat lighter, and less distinctly marked.

This species bears some resemblance to *N. graminis*, but may be easily distinguished by the thoracic bristles being entirely black, by its lighter colouring, moustache

with black hairs above, instead of being entirely yellow, and thorax with two instead of one median stripe.

N. brunneus occurs commonly settled on roads and on open hillsides. My dates range from December 19 to January 25. It also occurs in New South Wales.

39. *ASILUS*, L.

Large, brightly-coloured flies; abdomen long and slender; ovipositor conical, and not laterally compressed.

Face somewhat projecting; moustache fairly large, but not nearly reaching to the antennæ. Antennæ rather longer than the head, the first joint two or three times the length of the second, the third about equal to, or sometimes distinctly shorter than, the first two joints together, and provided with a long slender style, which is about equal in length to the third joint. Thorax with short pubescence anteriorly, long bristles posteriorly. Abdomen long and slender, as a rule nearly bare, but occasionally hairy; weak lateral bristles sometimes present; genitalia of male large and globose, and broader than the preceding abdominal segment; ovipositor of female conical and not laterally compressed. Legs rather long, all joints bearing bristles. Wings large, the costal portion frequently rilled; cubital fork large and embracing the wing-tip, second posterior cell usually encroaching on the first posterior cell, fourth posterior and anal cells closed; wings usually tinted with brown or black, but never banded.

Of this genus three species—*A. alcetus*, *A. sydneyensis*, and *A. discutiens*—have been recorded from Tasmania, but the occurrence of the two last, which are New South Wales species, requires confirmation.

Table of the Tasmanian Species of Asilus (including the doubtful species).

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| 1. Abdomen black, clothed with long yellow pubescence. | DISCUTIENS, Walk. |
| Abdomen bare. | 2 |
| 2. Abdomen bright fulvous; slender species. | SYDNEYENSIS, Macq. |
| Abdomen grey; robust species. | ALCETUS, Walk. |

ASILUS ALCETUS, Walk.

Thorax black, with two median stripes, and sides bright yellow; abdomen yellowish-grey, robust, with white and black side-bristles; femora and tibiæ red; knees and tarsi black.

Length. Male, 17 mm.; female, 19 mm.

Hab. Mangalore.

Male. Face yellow; moustache yellow, with a few short black hairs above; back of head with tufts of very stiff, black, post-ocular bristles. Antennæ black, the third joint hardly longer than the first. Thorax deep black, with two bright yellow median stripes, and sides also bright yellow; thoracic bristles very long, black. Abdomen unusually robust, yellowish-grey, the sides of segments with tufts of yellow bristles; genitalia black, large and globular. Legs with femora and tibiæ red, knees and tarsi black, all joints bearing black bristles. Wings tinged with brown.

Female resembles the male; the side-bristles of the abdomen are yellow on the first to fifth segments, black on the sixth to eighth segments; ovipositor very small, and almost concealed beneath the last abdominal segment.

The above descriptions are those of the ordinary Tasmanian forms, but do not quite agree with Walker's type in the British Museum, which has the sides of abdomen with strong black bristles; I consider, however, that the type specimen is merely an unusual variety of the same species.

A. alcetus is easily recognised by its short robust shape, bright yellow thoracic stripes, dull grey abdomen, and yellow abdominal bristles. It may be found settled on roads, or on the ground in open grassy country, but cannot be described as common. My dates range from December 26 to January 25.

ASILUS DISCUTIENS, Walk.

Moustache yellow, with some black hairs above and below; thorax and abdomen black, the latter clothed with long yellow pubescence, which is not confined to the three basal segments (thus differing from *A. inglorius*, Mackay); femora and tibiæ red, with knees, tarsi, and bristles black.

Length. Female, 32 mm.

Hab. New South Wales.

The occurrence of this species in Tasmania requires confirmation.

ASILUS SYDNEYENSIS, Macq.

Moustache white; antennæ black; thorax black, with two rather obscure median stripes and sides yellow; abdomen bright fulvous, with base and apex black; femora and tibiæ bright orange-red, with knees, tarsi, and bristles black.

Length. Male, 21-26 mm.; female, 22-24 mm.

Hab. New South Wales.

The occurrence of this species in Tasmania requires confirmation.

Family VIII. BOMBYLIDÆ

Moderate-sized or rather large sun-loving flies; thoracic bristles usually present, but these are often concealed under dense furry pubescence; proboscis frequently much elongated; legs thin and slender and almost without bristles; wings with only three or four posterior cells.

Proboscis usually very long, though sometimes short. Vertex not at all sunk between the eyes, which are bare, usually touching or closely approximated in the male, and widely separated in the female, but occasionally touching in both sexes. Antennæ porrect, the third joint never annulated, but usually provided with a short style or a circlet of bristly hairs. Thorax often without any conspicuous bristles, but presutural, supraalar, and postalar bristles may be present; both thorax and abdomen often clothed with dense furry pubescence, or, rarely, with distinct scales. Legs thin and slender, either bare or with small weak bristles. Wings with only three or four posterior cells; submarginal cells varying from one to five in number; discal cell occasionally wanting; anal cell long, either closed or open; the radial and upper branch of the cubital vein frequently curved upwards, but in a few genera the cubital vein is unforked.

This family contains the well known bee-flies (*Bombylius* and *Systæchus*), which may often be seen hovering over flowers in the spring time. Species of *Geron* occur settled on flowers without hovering, those of *Argyramæba* frequent charred logs in the bush, those of *Anthrax* and *Comptosia* occur settled on the ground in hot sunny places.

Some difference of opinion exists as to the division of the *Bombylidæ* into subfamilies. Personally, so far as the Australian species are concerned, I recognise four subfamilies, the *Bombylinae*, *Lomatinae*, *Systropinae*, and *Anthracinae*, the limits of all of which are well marked, but if it is desired to subdivide the family further, then the genus *Cyrtomorpha* would be placed in the *Platypyginae*, and the genus *Marmasoma* in the *Toxophorinae*. Three of the four Australian subfamilies are represented in Tasmania.

Table of the Tasmanian Subfamilies of Bombylidæ.

1. The bifurcation of the radial and cubital veins takes place at a right angle, almost opposite the median cross-vein. Anthracinae.
The bifurcation of the radial and cubital veins takes place at an acute angle, at a considerable distance from the anterior cross-vein. 2

- 2 Abdomen rounded or conical, usually with dense furry pubescence; proboscis long (except in those species with a simple cubital vein); radial vein never with a strong loop before its end.

Bombylinæ.

Abdomen flattened, bare, and usually parallel-sided; radial vein with a strong loop before its end

Lomatinae.

Subfamily Bombylinæ.

This subfamily is the largest and most typical of the *Bombylidae*. It contains the well-known "Bee-Flies," which may often be seen hovering over flowers in the spring and early summer. Typically the abdomen is very broad, and covered with long furry pubescence, but in a few genera it is narrow and conical, and almost bare; it is, however, never flattened as in the *Lomatinae* and *Anthracinae*. The cubital vein is normally forked, but there is a peculiar group, which should perhaps form a separate subfamily, in which the vein is unforked, the head situated low down beneath a very gibbous thorax, as in the *Cyrtidae*, and both body and legs are devoid of pubescence. This curious group is represented in the Australian region by a single Tasmanian genus, *Cyrtomorpha*, now recorded for the first time. The correct position of the new genus *Marmasoma* is also open to doubt, owing to the scaly vestiture, and the long bristles of the body and legs. If the subfamily *Torophorinae* is recognised, it should be placed there, but until the Australian *Bombylidae* are properly worked out, and the affinities of the different genera ascertained, I have preferred to place it in the *Bombylinae*.

Table of the Tasmanian Genera of Bombylinae.

- | | |
|--|------------------------|
| 1. Discal cell wanting; cubital vein unforked, extremely humpbacked, small bare flies. | |
| | CYRTOMORPHA, Gen. nov. |
| Discal cell present; cubital vein forked. | 2 |
| 2. Abdomen narrow, conical and not with dense furry pubescence. | 3 |
| Abdomen broad, rounded, and bearing dense furry pubescence. | 4 |
| 3. Wings with only three posterior cells. GERON, Meig. | |
| Wings with four posterior cells; thorax and legs bristly. | MARMASOMA, Gen. nov. |

4. Wings with first posterior cell open; first and second basal cells of equal length.

SISYROMYIA, Gen. nov.

First posterior cell closed.

5

5. Wings with first basal cell much longer than the second.

BOMBYLIUS, L.

First and second basal cells of equal length.

SYSTECCHUS, Lw.

40. CYRTOMORPHA, Gen. nov. (Fig. 30).

Small, bare, extremely humpbacked flies, resembling *Cyrtidae*. Proboscis short; wings with the discal cell wanting, and the cubital vein unforked.



Fig. 30. Wing of *Cyrtomorpha paganica*.

Head small, situated low down below the greatly arched thorax. Proboscis short, about half the length of the head, projecting forwards. Antennæ a little shorter than the head, the first and second joints apparently anastomosed, and about half the length of the third, which is a slender bulb-shape, tapering towards the apex, and provided with a bare, thin style, which is but little shorter than the third joint; the antennæ thus appear to consist of only two joints and a long style. Thorax extremely gibbous, bearing short, dense, upright pubescence, but without any sign of bristles. Abdomen broad, short, and rounded, bearing short depressed pubescence. Legs slender, bare, and without any sign of bristles. Wings with the discal cell wanting, and the cubital vein unforked; radial vein unusually short; discal vein forked; first basal cell considerably longer than the second basal cell; anal cell rather broad, open.

This genus seems to be most nearly allied to the Mediterranean and Western Asiatic genus *Cyrtosia*, but is distinguished by the short instead of long proboscis, the shorter radial vein, and differently placed discal vein. From all the other known Australian genera of the *Bombylidae* it may be distinguished by the unforked cubital vein and by the absence of the discal cell. This genus is proposed for a scarce species, which is only known to occur in Tasmania.

CYRTOMORPHA PAGANICA, Sp. nov. (Fig. 30).

Antennæ, front, and thorax black, the thorax bearing dense, pale yellow pubescence; abdomen black, with hind-margins of all segments dark yellow; legs bright yellow, the tarsi brownish at the tips; wings hyaline.

Length, 4.5 mm.

Hab. Mangalore.

? *Male*. Face orange-brown; proboscis black. Front brownish-black, with a long median furrow. Eyes bare, separated, but not very widely. Antennæ black, of the form described under the generic characters. Thorax black, covered with dense, upright, pale yellow pubescence, but without any sign of bristles. Abdomen black, with hind-margins of all segments dark yellow, the yellow margins being broadest on the apical segments, the whole bearing short depressed yellowish-white pubescence on dorsum, and fairly long, similarly-coloured pubescence on sides. Legs with femora yellow, brownish at the base, tibiæ clear yellow, tarsi yellow with the tips brownish, all the joints being absolutely without bristles. Wings hyaline, veins yellow. Halteres pale yellow.

This species bears more resemblance to the *Cyrtidæ* than to the *Bombylidæ*, but may be distinguished by the venation, and by the absence of the large squamæ that are characteristic of the former family.

C. paganica is at present known from only a single specimen, which was taken in flight by myself on January 31, 1913.

41. GERON, Meig. (Fig. 31).

Humpbacked flies, with a narrow, conical abdomen, both thorax and abdomen bearing dense pubescence; wings with three posterior cells only.

Head set low down in front of the greatly arched thorax. Proboscis long, about three times the length of head. Palpi very short. Eyes joined in male, separated in female. Antennæ a little longer than the head, the first joint thin, more than twice the length of the second, the third about the length of the first and second together, evenly pointed. Thorax much arched, and bearing long pubescence. Abdomen narrow and conical, bearing long pubescence. Legs long and slender, the tibiæ with a few very short bristles. Wings with three posterior cells, which are all open; anal cell closed; cubital vein with a large fork, which embraces the wing-tip.

This genus may be easily distinguished by the small number of posterior cells. In Tasmania two species are known to occur.

Table of the Tasmanian Species of Geron.

1. Pubescence yellow; wings partly tinged with brown; vein closing the discal cell waved. DISPAR, Macq.
2. Pubescence white; wings absolutely clear; vein closing the discal cell straight. HILARIS, Sp. nov.

GERON DISPAR, Macq.

Syn. *Geron cothurnatus*, Bigot.

Thorax and abdomen velvet-black, with long yellow pubescence; legs entirely black (♂) or black with posterior femora pale brownish-yellow (♂); wings strongly tinged with brown along the costa; the vein closing outwardly the discal cell waved.

Length. Male, 6 - 6.5 mm; female, 4 - 6.5 mm.

Hab. Bagdad Valley, Hobart, South Bridgewater. (Probably generally distributed.) Also in New South Wales and Victoria.

Male. Eyes joined from the vertex to the antennæ, flattened in front, and somewhat sunk at the line of junction. Proboscis and antennæ black, the first antennal joint more than three times the length of the second, and bearing extremely long, dense, black hairs; second joint extremely short, the third about equal in length to the first two together. Thorax much arched, velvet-black, with long, dense, yellow, upstanding pubescence, and very short, golden, depressed pubescence. Abdomen similarly coloured, and with similar pubescence to that of the thorax. Legs entirely black. Wings tinged with brown along the costal margin, the amount of brown varying in different specimens; remainder of wing hyaline; the veinlet closing outwardly the discal cell is conspicuously waved; halteres with stem whitish, knob black.

Female resembles the male, but the eyes are well separated, and the posterior femora are pale brownish-yellow, with only the apex black; the middle femora may be either yellow or black, the anterior femora always black. The front is velvet-black, and the base of antennæ surrounded with silvery pubescence.

This species varies very greatly in size, but may be easily distinguished by the yellow and golden pubescence, the brown-tinged wings, and the waved veinlet closing the discal cell.

G. cothurnatus, Bigot, would appear from Bigot's description to be merely a pale variety of this species.

G. dispar is common and generally distributed; it frequents flowers in the bush. My dates range from November 20 to March 24.

GERON HILARIS, Sp. nov. (Fig. 31).

Thorax and abdomen velvet-black, with white pubescence; legs black; wings absolutely clear, with the vein closing the discal cell quite straight.

Length. Male, 4 mm.

Hab. Bellerive.



Fig. 31. Wing of *Geron hilaris*.

Male. Eyes joined from the vertex to the antennæ, the line of junction being much depressed. Proboscis black, long and slender. Antennæ black, about the same length as the head, the first joint about twice the length of the second, the third longer than the first two together. Thorax velvet-black, with long, dense, upstanding, white pubescence, and a little short, white, depressed pubescence. Abdomen similarly coloured, and with similar pubescence to that of the thorax. Legs entirely black. Wings absolutely hyaline, the vein closing outwardly the discal cell quite straight; halteres pale brown.

This species may be distinguished from *G. dispar* by the straight veinlet closing the discal cell, by the shorter first antennal joint, by the white pubescence, and the clear wings.

G. hilaris I have only met with frequenting flowers on the sand dunes at Bellerive; time of occurrence February.

42. MARMASOMA, Gen. nov. (Fig. 32).

Humpbacked, bristly flies, with the vestiture consisting largely of scales. Abdomen long, narrow and conical, decumbent with the apex upraised; proboscis about one-and-a-half times the length of head; antennæ slender, slightly longer than the head, the first joint fully three times the length of the second, the third a little longer than the first, and provided with a pointed, two-jointed style; femora

spinose beneath; tibiæ with numerous long bristles; wings with four posterior cells, which are all open; anal cell also open; discal cell sharply angulated below; number of sub-marginal cells two.



Fig. 32. Wing of *Marmasoma sumptuosa*.

Head about equal in breadth to the thorax; eyes in male joined. Proboscis about one-and-a-half times the length of head. Palpi very slender, nearly one-third the length of the proboscis. Antennæ slender, slightly longer than the head, the first joint bearing short hairs above and very long hairs below, fully three times the length of the second joint, the third very slightly expanded, a little longer than the first, and provided with a thin, two-jointed style, which is about one-third its length. Thorax very convex, bearing numerous bristles and long bristly hairs; scutellum much depressed, bearing marginal bristles. Abdomen of an elongated, conical shape, with the apex upraised, nearly bare. Legs slender, the posterior femora with numerous stout bristles beneath, anterior and middle femora with one or two bristles close to the apex; tibiæ with numerous long bristles; tarsi long, about equal in length to the tibiæ, the joints marked by spurs. Wings with two sub-marginal and four posterior cells, the latter as well as the anal cell, open; discal cell sharply angulated below, the angle being frequently marked by a recurrent veinlet.

This genus agrees with the North and South American genus *Lepidophora* and the Palæarctic and African genus *Torophora* in having the vestiture consisting largely of scales. From the former genus it may be distinguished by the shorter and differently proportioned antennæ, with a two-jointed style, from the latter by the four instead of three posterior cells, and by the open anal cell, and from both these genera by the hind-angle of the wings being undeveloped. The shape of the wings more resembles that of the Mediterranean and Western Asiatic genus *Amictus*, and the European and Asiatic genus *Cyllenina*; from the former of these *Marmasoma* is distinguished by the first joint of antennæ being densely hairy, and the third joint bare and provided with a long two-jointed style, also by the sharply-angulated discal cell, and the wide open first posterior cell; from the latter by the two instead of three

submarginal cells, by the long proboscis, and the longer and differently formed antennæ; and from both these genera by the scaly vestiture.

Marmasoma therefore appears to form a connecting link between *Lepidophora* and *Toxophora* on the one hand, and *Amictus* and *Cyllenina* on the other. The exact position of this group of genera seems to be open to some doubt. They have been placed, together with a few other genera, in a subfamily, the *Torophorinæ*. The limits of this subfamily, however, seem to be ill-defined, and until the Australian *Bombylidæ* are properly worked out, and their correct affinities ascertained, I have preferred to place *Marmasoma* in the *Bombylinae*, with which it seems to show certain relationships.

Marmasoma may be easily distinguished from the other Tasmanian genera of *Bombylidæ* by the humpbacked shape, bristly thorax and legs, and long, bare abdomen. Only one species is at present known.

MARMASOMA SUMPTUOSA, Sp. nov. (Fig. 32).

Thorax dark brown, with two median whitish stripes, bordered inwardly with fulvous, anterior part of dorsum and sides with dense fulvous pubescence; abdomen clothed with fulvous scales, leaving bare a row of large, confluent, dark brown, centre spots; femora black, covered more or less thickly with fulvous scales; tibiæ fulvous, tarsi brown; wings spotted.

Length. Male, 8.5-11 mm.

Hab. Bagdad Valley, Hobart. (Also in Victoria.)

Male. Face barely projecting; eyes joined for a long distance, reducing the front to an ocellar tubercle and a lengthened frontal triangle, the former being black, the latter usually yellow. Antennæ black, of the form described in the generic characters, the first joint bearing dense yellow hairs, which are short above, long below, also with a few black hairs above; the third joint and style completely bare. Palpi black, short and slender; proboscis black. Back of head covered with dense fulvous pubescence. Thorax greatly humped, dark brown, with two whitish median stripes, which are bordered inwardly with fulvous; anterior part and sides of thorax with dense fulvous pubescence, and numerous long black bristles; scutellum dark brown, powdered with fulvous scales, and bearing six stout, black, marginal bristles, besides a few weak ones. Abdomen of a dark brown ground-colour, but powdered so extensively with fulvous scales as to appear fulvous, with a row of large, dark brown, centre spots, the

whole bare except for a few black hairs on the sides of the first three segments. Legs with femora black, covered below with fulvous scales; tibiæ fulvous; tarsi black; anterior and middle femora with a few black bristles towards the apex, the posterior femora with a complete row of black bristles below; tibiæ with numerous very long black bristles; tarsi with the joints marked by spurs. Wings hyaline, with dark brown costal margin, and suffused dark brown spots on middle of first basal cell, apex of second basal cell, anterior cross-vein, base of cubital fork, the two branches of cubital fork, outer veinlet of discal cell, and middle of veinlet closing discal cell below; the angulation of the discal cell below is frequently marked by a small veinlet entering the cell.

Variation. A male taken at Mangalore on November 8, 1913, differs considerably from the type, the colour being pale grey instead of fulvous, and the long hairs on the first antennal joint white instead of yellow, also in the wings the upper branch of the cubital fork has a small veinlet on its lower side.

This species may be readily recognised by its humped appearance, bristly thorax and legs, narrow bare abdomen, and spotted wings. I had not noticed any specimens prior to 1913, but during the November of that and the following year, it occurred not uncommonly, either settled in the sunshine on bare ground, or frequenting flowers. My dates range from November 8 to November 29, but it probably remains on the wing for some time longer.

BOMBYLIIUS (*Sensu lato*).

A large number of Australian species have been described under the name *Bombylius*, but most of these do not belong to the genus in its restricted sense. I have examined the specimens in the collection of the British Museum, which contains all Walker's types, and find that the species seem to fall into four natural groups, distinguished by the closed or open first posterior cell, and the relative length of the first and second basal cells. Another character that shows great variation is the form of the radial vein, which is almost straight in some species and boldly curved up in others. At first I considered that this character might provide generic distinctions, but a careful examination of the different species has led me to the conclusion that it is of specific value only. Confirmation of this view is supplied by the genus *Ucmptosia*, in which a similar diversity in the form of the radial vein occurs. The Australian species described under *Bombylius* I place in four

genera, one of which is new. They are distinguished as follows:

1. First posterior cell closed. 2
 First posterior cell open. 3
2. First basal cell longer than the second.

BOMBYLIUS, L.

First and second basal cells of about equal length.

SYSTECCHUS, Lw.

3. First basal cell much longer than the second.

DISCHISTUS, Lw.

First and second basal cells of almost equal length.

SISYROMYIA, Gen. nov.

Of these genera *Bombylius*, *Systechus*, and *Sisyromyia* occur in Tasmania.

43. BOMBYLIUS, L. (*Sensu stricto*) (Fig. 33).

Thorax and abdomen broad, covered with dense, furry pubescence; proboscis long and slender; wings with the first posterior cell closed, anal cell open; first basal cell much longer than the second basal cell.

Head small, narrower than the thorax. Eyes joined in male, separated in female. Proboscis long and slender. Antennæ approximated at the base, the first joint much longer than the second, and bearing long hairs, the third differing much in shape and longer than the first two joints together. Thorax considerably arched. Abdomen broad and rounded; both thorax and abdomen clothed with dense furry pubescence. Legs long and slender, with small bristles. Wings usually hyaline, with a brown fore-margin, but sometimes spotted; the first posterior cell always closed far above the wing-margin; anal cell open; the first basal cell considerably longer than the second basal cell.

This genus comprises the well known "Bee flies," which may often be seen hovering over flowers, whilst they suck the nectar with their long proboscis, or at other times settled on the ground in warm sunny places.

Bombylius is a genus of very wide distribution, well represented in the Australian region, but not known to occur in New Zealand. From Tasmania six species have been described, but these do not all belong to the genus in its restricted sense. Of these *B. fuscus*, Macq. is a true *Bombylius*, *B. auratus*, Walk, and *B. brevis*, Macq, and probably also *B. albicinctus*, Macq, belong to *Sisyromyia*, whilst the position of *B. tenuicornis*, Macq, and *B. consobrinus*, Macq, is doubtful. Two other true species of *Bombylius* are now added. Of other Tasmanian species

belonging to this group, *Bombylius crassus*, Walk, previously described only from the Australian mainland, is a *Systoechus*, and *Systoechus eulabiatus*, Bigot, is a *Sisyromyia*.

Table of the Tasmanian Species of Bombylius.

1. Golden-haired, very small species; abdomen without any black hairs. CHRYSENDETUS, Sp. nov.

Fuscous-haired species; abdomen with intermixed long black hairs. 2

2. Face in male narrow, about the width of one eye; legs pale red. FUSCANUS, Macq.

Face in male broad, about the width of two eyes; legs dark reddish black. PALLIOLATUS, Sp. nov.

In addition to the above two species described by Macquart under the names *Bombylius tenuicornis* and *Bombylius consobrinus*, which are unknown to me, may belong here. The former is described as a red-haired species, with legs red, and wings hyaline, with base and foremargin fuscous. Length, female 8 mm., of proboscis 4 mm. *B. consobrinus* is described as a yellow-haired species, with legs red, and wings grey, with the base and foremargin darkened. Length, male and female, 5.5 mm.

BOMBYLIUS FUSCANUS, Macq.

Syn. ? *Bombylius matutinus*, Walk.

Fuscous-haired species, the abdomen with intermixed, scattered, long black hairs; femora and tibiæ pale red; wings hyaline, with base and basal part of foremargin dark brown; face in male narrow, about the width of one eye.

Length. Male, 5-9 mm.; female, 6 mm.

Hab. Generally distributed. (Also in Victoria.)

Male. Face narrow, and nearly parallel-sided, hardly the width of one eye, fuscous, and bearing dense, long, black hairs. Proboscis slender, about equal in length to the thorax. Antennæ black, the first joint three times the length of the second, and bearing long black hairs, the third strap-shaped, about equal in length to the first two joints together, and terminated by a pointed style. Thorax drab, arched, covered with dense, furry, fuscous pubescence, which is intermixed sparse black pubescence; scutellum similarly coloured. Abdomen drab, bearing sparse fuscous pubescence and scattered, long, black hairs. Femora, tibiæ, and tarsi light red, the tarsi with the tips darkened. Wings hyaline, with base and basal part of foremargin dark brown.

Female resembles the male very closely, but the eyes are widely separated, and the ground-colour of the abdomen beneath the pubescence is black.

Variation. This species varies extremely in size; some specimens being twice the size of others.

The type of *B. matutinus*, *Walk.*, in the British Museum very probably belongs to this species, but it is in too bad condition for absolute identification.

B. fuscatus is a common species in the spring and early summer. My dates range from October 26 to December 24.

BOMBYLIUS PALLIOLATUS, Sp. nov. (Fig. 33).

Fuscous-haired species; abdomen with intermixed long, dense, black hairs; legs dark red or reddish-black; wings hyaline, with base and basal part of foremargin dark brown; face in the male broad, nearly the width of the two eyes together.

Length. Male, 6.5 - 10 mm.; length of proboscis 3 - 5 mm.

Hab. Mangalore.

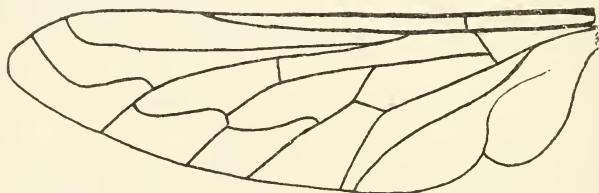


Fig. 33. Wing of *Bombylius palliolatus*.

Male. Face fuscous, broad, nearly the width of the two eyes together, and bearing long black hairs. Eyes short and narrow. Front deep brown, very short, but fairly broad; vertex with long black hairs. Proboscis black, slender. Antennæ black, the first joint three times the length of the second, and bearing long black hairs, the third strap-shaped, distinctly longer than the first two joints together, and terminated by a minute pointed style. Thorax drab, covered with very dense fuscous and black furry pubescence, the black hairs being the longest; scutellum similarly coloured, and bearing very long black hairs. Abdomen very broad, clothed with very dense, long, furry, fuscous and black pubescence. Legs dark red or reddish-black; posterior femora with a row of long black bristles; all tibiae with strong, short bristles; first joint of posterior tarsi distinctly fringed with bristles on the inner side. Wings hyaline or tinged with brown, the base and basal part of foremargin dark brown.

This species bears a very close resemblance to *B. fuscus*, but is a much more hairy insect, for whilst *B. fuscus*, even in fresh specimens, has a bare and denuded look, *B. palliolatus* is completely covered with a very thick and long furry pubescence; the legs too are distinctly darker. The chief distinction, however, is found in the face, that of *B. palliolatus* being almost twice the width of *B. fuscus*, and the eyes being very much shorter.

There is a specimen of this species in the British Museum collection, labelled *Bombylius matutinus*, Walk. It is, however, as shown by the broad face, quite distinct from the type of *B. matutinus*, which is also in the Museum collection. The latter specimen is badly denuded, but it may very probably be identical with *B. fuscus*, Macq.

B. palliolatus is a much scarcer species than *B. fuscus*. It seems to be an early spring species, my dates ranging from September 27 to October 22.

BOMBYLIUS CHRYSENDETUS, Sp. nov.

A very small, golden-haired species. Abdomen without any black hairs; thorax velvet-black; legs light or dark red; wings hyaline, with base and basal part of foremargin brown.

Length. Male, 5 mm.; female, 5.5 mm.

Length of proboscis, 2 mm.

Hab. Mangalore.

Male. Face rather narrow, grey, with long black hairs. Front extremely small, owing to the joined eyes reaching almost to the antennæ; vertex with a tuft of black hairs. Proboscis black, slender, rather short. Antennæ black, about the same length as the head, the first joint about twice the length of the second, and bearing long black hairs, the third strap-shaped, a little longer than the first two joints together, and terminated by a pointed style. Thorax velvet-black, with upright dull yellow pubescence and depressed golden pubescence. Abdomen dull brownish-black, with pubescence similar to that of the thorax. Legs with femora and tibiæ rather dark, dull red; tarsi and apex of tibiæ black; posterior femora with long black bristles beneath. Wings hyaline, with the base and basal part of foremargin brown.

Female resembles the male, but the eyes are widely separated; the hairs of the face yellow instead of black; the front broad, bearing short, depressed, golden pubescence; the pubescence of the body generally brighter; and the legs a paler red.

This species may usually be recognised by its small size, but may occasionally be confused with unusually small specimens of *B. fuscatus*; from such specimens, however, it may be distinguished by the complete absence of any black abdominal hairs, by the ground-colour of the thorax being velvet-black instead of drab, and by the depressed golden pubescence of the thorax and abdomen.

This species bears a considerable resemblance to *B. nanus*, Walk. from Western Australia. It is probably distinct, but the type being in bad condition, the question cannot be satisfactorily settled until more specimens from Western Australia are available for comparison.

B. chrysodetus is not a common species. It frequents teatree blossom during the month of December.

44. SYSTÆCHUS, Lw. (Fig. 34).

Thorax and abdomen very broad, and bearing long furry pubescence; proboscis long, moderately slender; wings with the first posterior cell closed; anal cell open; first and second basal cells of almost equal length.

Head small, set rather low in front of the broader and considerably arched thorax. Proboscis long, moderately slender. Antennæ about the same length as, or rather longer than, the head, the first joint considerably longer than the second, the third usually longer than the first two together, and terminated by a small style. Thorax and abdomen broad, the latter clothed with very dense, furry pubescence, which, in Australian species, is usually banded and produced into tufts on either side of the apex. Legs long, moderately slender; posterior femora with bristles beneath; all tibiæ with short bristles. Wings frequently spotted; first posterior cell closed at a considerable distance above the wing-margin; anal cell open; first and second basal cells of almost equal length.

This genus has so far only been recorded from the Australian region by Bigot, who placed in it a species, *S. eulabius*, which I have removed to *Sisyromyia*; several of the species described under *Bombylius*, however, should be placed here. One of these occurs in Tasmania.

SYSTÆCHUS CRASSUS, Walk. (Fig. 34).

Syn. *Bombylius crassus*, Walk.

Bombylius platyrus, Walk.

Thorax fuscous; abdomen clothed in dense, very pale brown pubescence, banded across the middle with rich,

dark brown, and with two similarly coloured anal tufts; legs pale red; wings spotted.

Length. Male, 12-13 mm.

Length of proboscis, 5-5.5 mm.

Hab. Southern and Northern Tasmania.

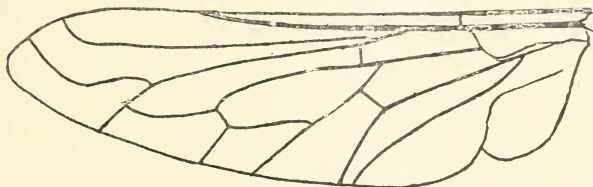


Fig. 34. Wing of *Systoechus crassus*.

Male. Face covered with pale golden pubescence, front with darker golden pubescence. Proboscis black, moderately slender. Antennæ black, the first joint twice the length of the second, and bearing long black hairs, the third about one-and-a-half times the length of the first two together, cylindrical, tapering towards the apex, which is clearly truncated, and terminated by a short, very thin, pointed style. Thorax deep drab, covered with similarly coloured dense pubescence, which, however, if viewed from the front, appears a very pale golden-brown. Abdomen covered with dense, very pale brown pubescence, with a dark brown band across the centre, and two dark brown sub-apical tufts. Legs light red, the bristles of the tibiæ similarly coloured; tarsi apically darkened. Wings hyaline, the foremargin brown, and brown spots situated near apex of first basal cell, at apex of second basal cell, at each lower corner of the discal cell, and at base of the cubital fork.

This splendid insect, the finest of the Tasmanian *Bombyliidæ*, may be easily recognised by its banded abdomen and spotted wings. It occurs hovering over low flowers in the spring time, and moves with extreme rapidity, appearing in front of a flower one moment, and vanishing the next. It probably occurs not uncommonly in suitable localities. My dates range from October 21 to November 9.

45. *SISYROMYIA*, Gen. nov. (Figs. 35 and 36)

Thorax and abdomen broad, bearing long furry pubescence; proboscis long and frequently thickened; wings with the first posterior cell open, and the first and second basal cells of almost equal length.

Head about equal in breadth to the thorax. Proboscis long, frequently thickened, and with the tip sometimes ex-

panded. Eyes bare, joined in male, separated in female. Antennæ approximated at the base, the first joint slender and much longer than the second, the third as long as, or considerably longer than, the first two together, varying in form in the different species. Thorax slightly arched. Abdomen short, about equal in breadth to, or a little broader than, the thorax; both thorax and abdomen clothed with dense, furry pubescence. Legs of medium length; posterior femora spinose beneath; tibiæ with conspicuous bristles. Wings with both the first posterior and the anal cell open; the first and second basal cells of almost equal length; radial vein varying much in the different species, sometimes nearly straight, at others boldly curved up towards the costal margin.

This genus may be easily recognised by the open first posterior cell in conjunction with the first and second basal cells of almost equal length. It is one of the most characteristic Australian genera, and contains a considerable number of species, which, though resembling those of *Bombylius*, have yet a characteristic appearance of their own. Two species have been recorded from Tasmania, whilst a third species, *Bombylius albicinctus*, Macq, probably belongs here. The last named species is described as being red-haired; abdomen with a white stripe; femora black; tibiæ red; wings hyaline with foremargin fuscous; length, female, 6mm.

Table of the Tasmanian Species of Sisyromyia.

1. Abdomen with a bright yellow centre stripe; wings dark grey with the base ferruginous; large species. AURATA, Walk.
2. Abdomen unstriped, clothed in uniform long yellow pubescence; wings hyaline with foremargin brownish; small species. BREVIROSTRIS, Macq.

SISYROMYIA AURATA, Walk (Fig. 35).

Syn. *Bombylius auratus*, Walk.

Bombylius crassirostris, Macq.

Thorax and abdomen black, covered with dense, but rather short, golden pubescence; abdomen with a broad, bright yellow, median stripe; femora and tibiæ pale red; wings dark grey with the base ferruginous.

Length. Female, 12 mm.

Hab. "Tasmania and Western Australia" (Walker); also in South Australia.

Fig. 35. Wing of *Sisyromyia aurata*.

Female. Face and front covered with golden pubescence; vertex with a tuft of long black hairs. Antennæ black, the first joint about three times the length of the second, and bearing long black hairs, the third considerably longer than the first two together, strap-shaped, terminated by a small bristle-like style, and with one or two long black hairs a little below the apex. Thorax black, covered with short golden pubescence, and with long yellow and black hairs at sides and bordering the scutellum. Abdomen black, with a broad median stripe of bright yellow pubescence, scattered golden pubescence, and abundant long black hairs. Femora, tibiæ, and first joint of anterior and middle tarsi pale red; remaining tarsal joints and the whole of the posterior tarsi black; posterior femora beneath with a complete row of spine-like bristles; all tibiæ with bristles, but these are longest and stoutest on the posterior pair; first joint of posterior tarsi fringed with short bristles. Wings dark grey, with the base ferruginous; discal cell large; radial vein boldly curved up to the costal margin, which it meets at almost a right-angle.

This fine insect is easily recognised by its golden appearance, bright yellow abdominal centre-stripe, and large size. It was described by Walker from Western Australia and Tasmania, but confirmation of its occurrence in Tasmania seems desirable. It also occurs not uncommonly in South Australia.

SISYROMYIA BREVIROSTRIS, Macq. (Fig. 36).

Syn. *Bombylius brevirostris*, Macq.

Systæchus eulabiatus, Bigot.

Thorax and abdomen clothed in long yellow pubescence; femora black; tibiæ red; wings hyaline with foremargin brownish.

Length. Male, 6-7 mm.; female, 6.5 mm.

Hab. Bagdad.

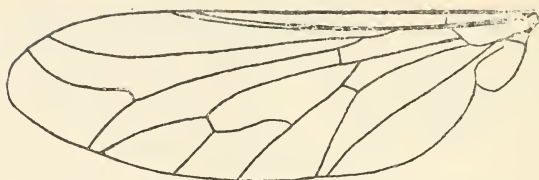


Fig. 36. Wing of *Sisyromyia brevirostris*.

Male. Face covered with pale yellow pubescence, front with pale golden pubescence. Proboscis black, nearly three times the length of the head, with the tip slightly inflated. Antennæ black, the first joint about three times the length of the second, and bearing long yellow hairs, the third about equal in length to the first two together, of a slender strap-shape, with a rounded style-like apex. Eyes joined. Thorax and abdomen of a dull black ground colour, which in fresh specimens is entirely covered with very long, furry, yellow pubescence, but this becomes very easily detached. Legs very slender, femora black, with pale yellow pubescence, anterior and middle tibiæ red, posterior tibiæ brown, the whole bearing minute bristles; tarsi black. Wings hyaline, with the foremargin brownish.

Female resembles the male, but the eyes are very widely separated, and the pubescence of the face and front paler.

This species seems to be very local, but is probably common where it occurs. The males hover in the air in the bright sunshine at a height of some five feet from the ground, but should a cold wind arise they disappear completely. It occurs during February.

Subfamily Lomatinæ.

This subfamily may be recognised by the radial vein of the wings being strongly looped before it reaches the costal margin, in conjunction with the short proboscis. The species may be either bare or covered with short pubescence, but never with the long, furry pubescence of the *Bombylinæ*; thorax comparatively flat; abdomen long and frequently flattened; posterior cells always four in number.

Table of the Tasmanian Genera of Lomatinæ.

1. Abdomen rather broad and greatly flattened, bearing abundant short pubescence; tibiæ with bristles; antennæ with a long style.

COMPTOSIA, Macq.

2. Abdomen very narrow, almost cylindrical, practically bare; tibiæ absolutely without bristles; antennæ without a style. DOCIDOMYIA, Gen. nov.

46. COMPTOSIA, Macq.

Antennæ composed of three very short joints and a long aristiform style; abdomen rather broad and distinctly flattened; both thorax and abdomen moderately pubescent; wings with the radial vein strongly looped before its end; number of submarginal cells two or three.

Head about equal in breadth to the thorax. Eyes very narrowly separated in male. More widely in female. Proboscis either porrect, and about half the length of head, or completely concealed within the oral aperture. Antennæ with the three joints very short, and almost concealed by stiff pubescence, the third terminated by a long aristiform style, which is about equal in length to the three antennal joints together. Thorax somewhat arched, and moderately pubescent. Abdomen rather broad and distinctly flattened, with fairly long lateral pubescence. Legs moderately slender; tibiæ with short bristles. Wings with either two or three submarginal cells, and four posterior cells, the latter being all open, as is also the anal cell; radial vein much looped before its end, and frequently strongly recurrent; the median cross-vein situated close to the apical end of the discal cell.

This genus contains a large number of Australian species. These fall into two divisions, according to the number of the submarginal cells, which may be either two or three. Macquart originally described the genus as possessing three submarginal cells, but afterwards placed in it species in which only two were present; this, I think, is quite correct, as the number of submarginal cells seems to me to be a specific character only. The considerable variation in the curvature of the radial vein also seems to be only of specific value. Many of the Australian species were described by Walker under the genus *Anthrax*.

From Tasmania three species have been described.

Table of the Tasmanian Species of Comptosia.

- | | |
|--|---------------------|
| 1. Wings brown, with hyaline spots, and a white hyaline band across the tips; number of submarginal cells two. | MACULIPENNIS, Macq. |
| Wings hyaline, with foremargin broadly brown, and four small brown spots below. | 2 |
| 2. Two submarginal cells. | GEOMETRICA, Macq. |
| Three submarginal cells. | CORCULUM, Walk. |

COMPTOSIA MACULIPENNIS, Macq

Syn. *Anthrax ocellata*, Walk.

Anthrax inclusa, Walk.

Anthrax cognata, Walk.

Wings brown, with hyaline spots, and a white hyaline band across the tips.

Length. Male and female, 12 mm.

Hab. Bagdad Valley.

Male. Face black, bearing dense golden pubescence. Proboscis short and stout, less than half the length of head. Antennæ black, about the length of head, the base concealed by black and golden hairs. Front black, with long black hairs above, and golden hairs below. Thorax black, bearing short golden pubescence, and a few long black hairs posteriorly. Abdomen black, the hind-margins of segments with short, golden, depressed pubescence, and sides of abdomen with long hairs, which are yellow on the first two, and black on the remaining segments. Legs, brownish-black. Wings large, brown, with a white hyaline band across the tips, and hyaline spots situated on the discal cell, and on the base of the first posterior cell; the radial vein is very slightly recurrent, and meets the costal margin at almost a right angle.

Female resembles the male very closely, but the eyes are more widely separated, and the white band across the wing-tips rather less conspicuous.

C. maculipennis is less frequently met with than *C. geometrica*, but at the same time can hardly be described as scarce. It occurs during February.

COMPTOSIA GEOMETRICA, Macq.

Syn. *Anthrax obscura*, Walk.

Wings hyaline, with the foremargin broadly brown, the brown colour being curved up in a half-circle above the base of the cubital fork, in the middle of which hyaline half-circle is a brown spot, and there are also three small brown spots below.

Length. Male and female, 10-11 mm.

Hab. Generally distributed.

Male. Face covered with rather long, pale golden pubescence. Proboscis stout, less than half the length of head. Antennæ black, about half the length of head, the base concealed by yellow hairs. Eyes very narrowly separated. Front black, bearing rather long black hairs. Thorax black, with very short, depressed, golden dorsal pubescence and long, black, lateral pubescence, and dense white pubescence below. Abdomen deep brown, the dorsum with scattered, short, golden, depressed pubescence centrally, and similar white pubescence towards the sides; sides of abdomen with long black hairs. Legs brown. Wings large, hyaline, with the foremargin broadly brown,

the brown colour being curved up in a half circle above the base of the cubital fork, in the middle of which hyaline half-circle is a brown spot, and there are also brown spots at each lower corner of the discal cell, and at the apex of the second basal cell; number of submarginal cells two; the four posterior and anal cells all open; the radial vein strongly recurrent before reaching the costa.

Female resembles the male very closely, but has the eyes more widely separated.

Variation. This species varies greatly in size, extremely small specimens being sometimes met with.

C. geometrica is a common species. It first appears towards the end of September, and may be found settled on the ground in warm sunny places throughout the early summer.

COMPTOSIA CORCULUM, Walk.

Syn. *Anthrax corculum*, Walk.

Comptosia tricellata, Macq.

Judging from Macquart's description, I think that there is little doubt that his *C. tricellata*, described from Tasmania, is the same as *C. corculum*, a well-known mainland species. This species resembles *C. geometrica* very closely, but is distinguished by possessing three instead of two submarginal cells. I have not met with it in Tasmania personally.

47. DOCIDOMYIA, Gen. nov. (Fig. 37.)

Antennæ much shorter than the head, the first and second joints rounded, the third bulb-shaped, without a style; abdomen very narrow and cylindrical, both thorax and abdomen practically bare; legs short, without bristles; wings with the radial vein strongly looped and slightly recurrent; first posterior and anal cells wide open; number of submarginal cells two.

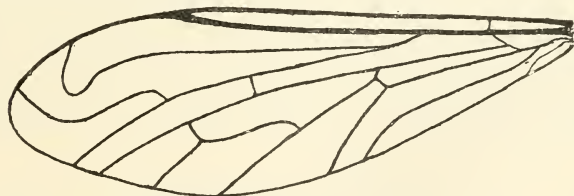


Fig. 37. Wing of *Docidomyia puellaris*.

Head large, broader than the thorax. Proboscis concealed within the oral aperture. Eyes in male narrowly

separated. Antennæ short, about one quarter the length of head; the first and second joints rounded and of about equal length, the third bulb-shaped, about as long as the two first joints together, and without a style. Thorax narrow, not at all arched, with a little short pubescence, but without any evident bristles. Abdomen bare, long, narrow, and cylindrical. Legs short, slender, and quite bare, even the tibiæ being without bristles. Wings of medium length, but narrow, the alula wanting, and the hind-angle quite sloped away; median cross-vein upright, situated a little beyond the middle of the discal cell; radial vein strongly looped and slightly recurrent; the four posterior cells and the anal cell all wide open; number of submarginal cells two; halteres long-stalked.

This genus is proposed for two undescribed species, one of which occurs both in Victoria and Tasmania, whilst the other seems to be confined to Victoria. The Tasmanian species is a slender, delicate fly, and bears more resemblance to a Syrphid than to one of the *Bombyliidæ*.

DOCIDOMYIA PUELLARIS, Sp. nov. (Fig. 37).

Face, front, and thorax black; abdomen black, the incisions of segments usually white; legs black, with the knees light brown; wings hyaline.

Length. 7 mm.

Hab. Bagdad. (Also in Victoria.)

Face, front, and antennæ black. Thorax black, with soft white lateral pubescence; both thorax and scutellum without bristles. Abdomen black, the hindmargins of segments usually narrowly white; first segment with white pubescence at sides. Legs black, with the knees light brown. Wings hyaline.

This species may be easily recognised by its slight, slender shape, absence of bristles, black colouration, and clear wings. The undescribed Victorian species, referred to previously, which may possibly be found to occur also in Tasmania, has the wings light brown, and the cubital fork possesses a long recurrent veinlet.

D. puellaris seems to be generally scarce; the only two specimens that I have met with occurred on November 7 and January 19 respectively.

Subfamily Anthracinæ.

This subfamily may be recognised by the venation, the bifurcation of the radial and cubital veins taking place at a right-angle, almost opposite the median cross-vein. The

species are rather flattened in shape, never humpbacked or conspicuously bristly, usually moderately pubescent, but never with the dense furry pubescence of the *Bombylinæ*.

In Tasmania three genera are known to occur.

Table of the Tasmanian Genera of Anthracinae.

- | | |
|--|--------------------|
| 1. Wings with three submarginal cells. | 2 |
| Wings with only two submarginal cells. | 3 |
| 2. Antennæ with a distinct style. | |
| | EXOPROSOPA, Macq. |
| 3. Antennæ without a distinct style. | ANTHRAX, Scop. |
| Antennæ with a style bearing an apical pencil of hairs. (Velvet-black species, with wings mostly black). | ARGYRAMÆBA, Schin. |

It should be noted that although the species of *Anthrax* have usually only two submarginal cells, yet varieties occur in which three are present, or occasionally there may be two on one wing and three on the other. In any case, however, the species may be distinguished from those of *Eroprosopa* by the want of any differentiated antennal style.

48. EXOPROSOPA, Macq.

(*Trinaria*, Muls. *Argyrosipila*, Rond. *Heteralonia*, Rond.
Defilippia, Lioy. *Eroptata*, Coquill.)

Third joint of antennæ elongate-conical, with a fairly long, clearly-differentiated, terminal style, ending in a microscopic bristle, but without any apical pencil of hairs. Proboscis short. Claws of posterior tarsi with a basal tooth. Wings with three submarginal cells; the four posterior cells and the anal cell all open.

Two species of *Eroprosopa* have been described by Macquart from Tasmania, neither of which is known to me, and I am unable to say whether or not they are correctly placed. The position of the second species (*E. bicellata*) is particularly doubtful, owing to its possessing only two submarginal cells. The following are Macquart's descriptions.

EXOPROSOPA OBLIQUEFASCIATA, Macq.

Black; head with white pubescence; abdomen banded with white, the sides spotted with brown; wings hyaline, with the base, costa, and two oblique stripes brown.

Length. 12 mm.

Hab. "Tasmania."

EXOPROSOPA BICELLATA, Macq.

Black, with red tomentum. Wings brown with hyaline spots; number of submarginal cells two.

Length. Male, 11 mm.

Hab. "Tasmania."

49. ANTHRAX, Scop. (Fig. 38.)

Antennæ without any clearly-differentiated style; wings with two submarginal cells; the bifurcation of the radial and cubital veins takes place at a right angle, almost in a line with the median cross-vein.

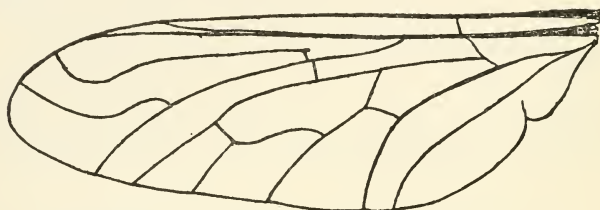


Fig. 38. Wing of *Anthrax minor*.

Head large, globular, as wide as the thorax. Proboscis short, not in the least projecting. Antennæ very small and short, widely separated at the base, the first joint cylindrical, the second cup-shaped, the third an elongated bulb-shape, without any differentiated style, the apex terminated by a microscopic bristle. Eyes separated in both sexes, but more widely in the female than in the male. Thorax rather large, flattened, and pubescent; scutellum with or without marginal bristles. Abdomen longer than the thorax, sometimes conspicuously flattened. Legs slender, the tibiæ with small, weak bristles. Wings with normally two submarginal cells, but varieties occur in which three are present, or there may be three on one wing and only two on the other; radial vein curved upwards, but never strongly looped as in the *Lomatinae*; upper branch of cubital fork much curved upwards; posterior cells four in number, which are all open, as is also the anal cell. The wings in Australian species are usually hyaline, with the costal margin brown, but they may be quite hyaline, or entirely suffused with brown.

A large number of Australian species have been described under the genus *Anthrax*, but many of these do not really belong here, but should be placed in the genera *Hyperalonia*, *Exoprosopa*, *Argyramacha*, and *Comptosia*. Of the true species of *Anthrax*, eight of the sixteen Australian species at present known occur in Tasmania.

The species belonging to this genus may usually be found settled on the ground in hot, sunny places, in which situations several of the species are abundant.

Table of the Tasmanian Species of Anthrax.

1. Wings with at least one half brown. 2
Wings hyaline, or at most with the foremargin brown. 3

2. Wings cut sharply in a nearly straight line into a deep brown basal half and a hyaline apical half.

INCISA, Macq.

Wings with the base and costal half suffused with brown, which melts gradually into the hyaline portion without any distinct line of demarcation; abdomen with two white bands.

ALTERNANS, Macq.

3. Wings completely hyaline; pubescence at sides of thorax yellowish-white; small species. MINOR, Macq.
Wings practically hyaline, but a little darkened along the course of the closely adjacent mediastinal and subcostal veins; pubescence at sides of thorax fulvous; small to middle-sized species.

NIGRICOSTA, Macq.

Wings hyaline, with the base and foremargin distinctly brown. 4

4. Large species (usually about 12 mm). 5
Small species (5 to 8 mm.). 6

5. The brown colouration of the foremargin never descends so far as the bifurcation of the radial and cubital veins, which is always clear; the black pubescence on sides of abdomen is confined to the third and subsequent segments, that on the second segment being pale yellow.

MARGINATA, Walk.

The brown colouration of the foremargin covers the bifurcation of the radial and cubital veins; the black pubescence on sides of abdomen commences on the second segment. VELOX, Sp. nov.

6. Pubescence at base of abdomen yellowish-white; wings rather dull. SIMPLEX, Macq.

Pubescence at base of abdomen silvery-white; wings brightly glistening. ARGENTIPENNIS, Sp. nov.

ANTHRAX INCISA, Macq.

This species was originally described by Macquart from Tasmania. I have not met with it personally, but there

is a specimen in the collection of the British Museum. It may be recognised by having the wings cut sharply into a deep brown basal half and a hyaline apical half, the dividing line running obliquely from a point on the costa about two-thirds the distance from the base of wing, to the posterior margin about one third the distance from the base. Macquart describes the abdomen as black with apex silvery, and length as 7 mm.

ANTHRAX ALTERNANS, Macq.

Front brown; thorax and abdomen brownish-black, the latter with two white bands; wings with the base and costal half suffused with dark brown, tips and posterior margin clear.

Length. Male and female, 11-12 mm.

Hab. Generally distributed.

Male. Head much produced in front. Face black, with a little yellow pubescence. Front dark brown, with short, stiff, black hairs bordering the base of antennæ outwardly. Antennæ black. Thorax brownish-black, with a collar of stiff brown hairs; scutellum testaceous, with black marginal bristles. Abdomen brownish-black, the second and fourth segments with a white band, the third with a very narrow yellow band, apex with white scaly pubescence; sides of abdomen with soft white and black pubescence. Legs black. Wings strongly suffused with dark brown, but tips and posterior margin hyaline.

Female resembles the male very closely, but the eyes are rather more widely separated.

This species may be readily recognised by its brownish wings and abdomen with two white bands. It seems to be generally common in Tasmania, and in the collection of the British Museum are specimens, apparently identical, from Western Australia, so the species is probably of very wide distribution.

A. alternans may commonly be met with settled on the ground in warm sunny places, during the spring and early summer.

ANTHRAX MINOR, Macq. (Fig. 38.)

Syn. *Anthrax vitrea*, Walk.

A small species with perfectly clear wings; thorax and abdomen brownish-black; pubescence at sides of thorax yellowish-white, at base of abdomen clear white.

Length. Male and female, 5-8 mm.

Hab. Bagdad Valley. (Probably generally distributed.)

Male and female. Thorax brownish-black, with dull white or yellowish-white pubescence at sides; scutellum similarly coloured, without any marginal bristles. Abdomen brownish-black, with short, depressed, white and yellow pubescence disposed in bands, which becomes very quickly denuded; base of abdomen fringed with clear white hairs on each side. Legs with femora black or brownish-black, tibiæ black or light brown, tarsi black. Wings absolutely clear, bright and glistening.

This species may be easily recognised by its small size and perfectly clear wings; the only species with which it can be confused is *A. nigricosta*, but the latter species has the long pubescence at the sides of thorax tawny instead of white.

A. minor is a fairly common species, and is probably generally distributed. My dates range from January 11 to March 1.

ANTHRAX NIGRICOSTA, Macq.

Wings practically hyaline, but a little darkened along the course of the closely adjacent mediastinal and subcostal veins; pubescence at sides of thorax fulvous; abdomen with a white band on the second segment; a species that varies very greatly in size.

Length. Male and female, 5-8 mm.

Hab. Generally distributed in Tasmania, Victoria, South Australia, and New South Wales.

Male. Eyes most closely approximated in front of the ocellar tubercle. Face narrow, black. Front black, with brown and white pubescence around the base of the antennæ. Antennæ black. Thorax brownish-black, with long fulvous pubescence in front and at sides; scutellum similarly coloured, with black marginal bristles. Abdomen black, with a white pubescent band on the second segment, which is usually visible even in denuded specimens; remainder of dorsum with short white and brown pubescence, which falls off very readily; the first segment has long tawny pubescence at sides, the second with long white pubescence at sides; remaining segments and apex with long scattered black hairs. Legs black, the femora frequently yellowish beneath. Wings hyaline, but frequently a little darkened along the course of the closely adjacent mediastinal and subcostal veins; base of wings yellow.

Female resembles the male very closely, but the eyes are more widely separated.

Variation. A specimen taken by myself at Mangalore on December 31, 1911, has three submarginal cells instead of the usual two; in other respects, however, it agrees perfectly with *A. nigricosta*, and I consider that it is merely a variety of that species. Other specimens show great variation in respect to size, some specimens being quite twice the size of others.

A. nigricosta may be recognised without much difficulty by the fulvous hairs on each side of the thorax, in conjunction with the white band on the second abdominal segment, and the practically hyaline wings. It seems to be common and generally distributed. My dates range from December 31 to February 13.

ANTHRAX MARGINATA, Walk.

Syn. *Anthrax fuscicostata*, Macq.

A large species. Wings hyaline with foremargin brown, but the brown colouration never descends so far as the bifurcation of the radial and cubital veins, which is always clear; abdomen broad and flattened, the black pubescence on sides confined to the third and subsequent segments, that on the second segment being pale yellow.

Length. Male and female, 11.5-14 mm.

Hab. Tasmania (generally distributed), Victoria, and New South Wales.

Male. Face and front black, the former covered with short white or yellow pubescence. Antennæ black. Thorax and scutellum dull brown or brownish-black, the thorax with pale fulvous anterior and lateral pubescence, and a tuft of white pubescence above the base of the wings, the scutellum with black marginal bristles. Abdomen broad and conspicuously flattened, black, with white pubescent bands on the second, fourth, and sixth segments, and narrow yellow pubescent bands on the third and fifth segments, but all these bands are very easily rubbed off, and are frequently wanting in dried specimens; the long pubescence along the sides of the abdomen, however, is present even in denuded specimens, and is of more value for identification; that on the first and second segments is dull yellow or yellowish-white, on the third yellow or white anteriorly, black posteriorly, on the fourth principally white, on the fifth and sixth principally black, on the apex white. Legs black. Wings hyaline, with the foremargin brown, but the brown colour never descends so far as the bifurcation of the radial and cubital veins, which is always clear.

Female resembles the male very closely, but the eyes are more widely separated.

This species may be easily recognised by its large size and flattened shape, in conjunction with the diagnosis given above. It is common, and generally distributed in Tasmania, and seems to be distributed over the whole of Eastern Australia. My only records are for February, but no doubt the species remains on the wing throughout the summer season.

ANTHRAX VELOX, Sp. nov.

A large species. Wings hyaline with foremargin brown, the brown colour completely covering the bifurcation of the radial and cubital veins; abdomen not flattened, the black pubescence at sides commencing on the second segment.

Length. Female, 13 mm.

Hab. Bagdad Valley.

Female. Face and lower fourth of front completely covered with short yellow pubescence, upper three-fourths of front black, with short black, and a little short dark yellow, pubescence. Antennæ black, with stiff black hairs at base. Thorax dull brown, with long yellow-brown pubescence anteriorly, and laterally; scutellum a little darker than the thorax, with marginal yellow hairs. Abdomen brownish-black, the dorsum bearing white and yellow pubescence disposed in bands, that on the second, fourth, and sixth segments being white, on the other segments yellow, but all these pubescent bands become quickly denuded; sides of abdomen with long hairs, those on the first segment pale yellow, on the second and third yellow anteriorly, black posteriorly, on the fourth white anteriorly, black posteriorly, on the fifth and sixth black; apex with short yellow and long black pubescence. Legs black, with short depressed yellow pubescence; posterior femora and all tibiæ with short black bristles. Wings hyaline, with the base and foremargin brown, the brown colour completely covering the bifurcation of the radial and cubital veins.

Male. The only specimen of the male that I have seen resembled the female described above very closely, but was considerably smaller in size.

The only other Tasmanian species with which *A. velox* can be confused is *A. marginata*. From the latter species it may be distinguished by the brown colouration of the foremargin being broader, and completely covering the bifurcation of the radial and cubital veins, also by the black tuft-like lateral hairs on abdomen commencing on the sec-

ond instead of on the third segment; the abdomen also is rounder, and less flattened in appearance. Of the mainland species the only one that *A. velox* resembles is *A. albirufa*, Walk, but in the latter species the brown colouration of the wings is diffused from the base, instead of from the middle of the costal margin.

A. velox occurs settled on the ground in sunny places, and may also be found on box bloom; it flies with great rapidity. I have only met with it during January.

ANTHRAX SIMPLEX, Macq.

A small species. Wings hyaline with foremargin brown; pubescence at base of abdomen yellowish-white.

Length. Male and female, 5-6 mm.

Hab. Bagdad Valley. (Also in New South Wales.)

Male and female. Face and front black, bearing short golden pubescence. Thorax dark brown, with yellowish-white or pale brownish-white anterior and lateral pubescence; scutellum dark brown. Abdomen dark brown, with long yellowish-white or very pale brown hairs on each side of the basal segment; dorsum with short, depressed, white and yellow pubescence, forming white bands on the anterior margins of the second and fourth segments, and yellow bands on the remaining segments. Legs black. Wings hyaline, rather dull, with base and foremargin brown.

Variation. A female taken by myself at Mangalore on December 24, 1911, has three submarginal cells on the right wing, and only two on the left.

A. simplex can be easily recognised by its small size, and wings with the foremargin broadly brown. The only other known small species having the wings similarly coloured is *A. argentipennis*, which is distinguished by having the pubescence at base of abdomen bright silvery-white.

A. simplex occurs commonly in the Bagdad Valley during December, and is probably generally distributed.

ANTHRAX ARGENTIPENNIS, Sp. nov.

Wings bright hyaline, with base and foremargin deep blackish-brown; abdomen with long silvery-white pubescence on sides of the first and second segments.

Length. Male and female, 7-10 mm.

Hab. Mangalore.

Male. Head distinctly produced in front; face and front black, with a little short golden pubescence. Antennæ black. Thorax brownish-black, with light brown

pubescence in front, and a little silvery-white pubescence at sides; scutellum similarly coloured. Abdomen brownish-black, with dense, long, silvery-white pubescence on sides of the first and second segments; sides of remaining segments and apex with long black hairs; dorsum with short white and yellow pubescence, the former forming a white band on the second segment. Legs black, comparatively stout. Wings hyaline, brightly glistening, the base and foremargin a deep blackish-brown.

Female resembles the male very closely, but the eyes are more widely separated.

This species resembles *A. simplex* somewhat closely, but may be distinguished by the long pubescence on sides of the first and second abdominal segments being bright silvery-white, instead of yellowish-white, by the larger size, and by the more glistening wings with darker foremargin.

A. argentipennis occurs not uncommonly in elevated bush at Mangalore, during the months of December and January. It frequents dry watercourses and similar situations.

50. ARGYRAMÆBA, Schin.

(*Spogostylum*, Willist. *Coquilletia*, Willist.)

Antennæ with a clearly differentiated style, which is terminated by a pencil of hairs.

Head broader than the thorax. Proboscis short, not in the least projecting. Eyes narrowly separated in male, more widely in female. Antennæ very small, the third joint more or less onion-shape, with a style-like prolongation, ending in a differentiated style with an apical pencil of hairs. Thorax bearing dense pubescence; scutellum without any marginal bristles. Abdomen flattened, broadening posteriorly, with a pointed apex, the whole bearing dense pubescence, which is longest at the sides. Legs of medium length, slender, tibiæ with rather long, weak bristles. Wings with the typical venation of the *Anthracinae*; number of submarginal cells two; first posterior cell wide open; anal cell either narrowly open, or closed on the wing-margin.

This genus is represented in Tasmania by a single species, which is easily recognised by its velvet-black abdomen, with silvery-white apex, and almost black wings.

ARGYRAMÆBA MACULATA, Macq.

Syn. *Anthrax maculata*, Macq.

Anthrax australis, Walk.

Thorax and abdomen velvet-black, the apex of abdomen silvery-white; wings with basal half, foremargin, and spots

black, the black colour occupying the great part of the wings, remainder hyaline.

Length. Male and female, 7-11 mm.

Hab. Generally distributed. (Also in Victoria and New South Wales.)

Male and female. Face and front black, with short, dense, black hairs. Antennæ black. Thorax black, with a collar of white or yellow hairs, and black hairs at sides. Abdomen black, with apex entirely silvery-white, or with silvery-white on either side, leaving the actual tip black; sides of abdomen with long dense hairs, which are white on the first segment, black on subsequent segments. Legs entirely black. Wings with the base and foremargin very broadly black, the black colour reaching to the hindmargin irregularly beneath the end of the discal cell, and along the hindmargin are four to six isolated, or partly isolated, black spots, but all these black markings differ in size and extent in different specimens, and may be partly confluent.

Variation. Besides the variation in the markings of the wings, referred to above, this species varies very greatly in size, the expanse of wings ranging from 20 mm. to 32 mm.

A. maculata is fairly common in Tasmania, and seems to be very widely distributed on the Australian mainland. It has a fondness for settling on charred stumps and logs in the bush. My dates range from November 7 to January 12.

Family IX. EMPIDÆ.

Head small, usually much narrower than the thorax. Proboscis frequently elongated, but sometimes short. Eyes in the male either joined or separated, in the female separated, except in the *Hybotinæ*. Antennæ composed of three joints. Either with or without a terminal style or arista, but the first joint is sometimes difficult to distinguish. Thorax usually gibbous, with, as a rule, well-developed dorsocentral, acrostichal, humeral, posthumeral, notopleural, supraalar, and postalar bristles. Abdomen narrow, either bare or with lateral bristles; the male genitalia large and complex. Legs slender, either nearly bare, or bearing stiff bristles, or tufts of hairs; the first joint of anterior tarsi sometimes inflated in the male. Wings with the anal cell usually shorter than the second basal cell, but in the *Hybotinæ* and *Brachystomatinae*, equal in length or longer, whilst in the *Tachydromiinae* it is altogether wanting; the discal cell is also sometimes wanting; the shape of the wings may be normal, or the hind-angle may be altogether sloped away.

The *Empidæ* form a very large family of small flies of inconspicuous appearance, which sometimes occur in great abundance. They are predaceous in their habits, preying on other diptera. Their habits are somewhat diverse. Species of *Hilara* occur flying in numbers over the surface of pools and streams, or, more rarely, over the bare ground; species of *Empis* may be found frequenting flowers or dancing in the air; those of *Leptopeza* frequenting low vegetation. The greater number of Tasmanian species occur in the spring time, whilst two species are found in midwinter; during the height of summer but few species are to be met with.

It will be noticed that in the present Paper I have adopted the spelling *Empidæ* and *Leptidæ*, rather than that of *Empididæ* and *Leptididæ*, as now used by some entomologists. The former spelling has been in use for over a century, and is formed in the usual way from typical genera. The latter spelling is derived from the supposed plural forms of *Empis* and *Leptis*; a generic name, however, can only exist in the singular, as there cannot be more than one genus of the name of *Empis*, or one of that of *Leptis*. Therefore the spelling *Empididæ* and *Leptididæ* is derived from words, which, notwithstanding their Greek origin, have no existence in scientific nomenclature. Under these circumstances I consider that the words *Empididæ* and *Leptididæ* are not only pedantic, but also incorrect.

For our present knowledge of the Australian *Empidæ*, we are largely indebted to Dr. M. Bezzi's "*Empididi Indo-Australiani Raccolti dal Signor L. Biró*,"* in which twenty Australian species are listed. Very little attention, however, has so far been paid to the Tasmanian species, and I am now able to record twenty-three species from Tasmania alone, whilst there is no doubt that when the wetter parts of the island are properly investigated this number will be largely increased.

Five subfamilies have been recorded from the Australian mainland, of which only three are at present known from Tasmania, but as the other two are almost certain to occur, I give the distinctions between all the five subfamilies.

Table of the Australian Subfamilies of Empidæ.

1. Anal cell wanting; discal cell united with the second basal cell.	Tachydromiinae
Anal cell present.	2

*Annales Musei Nationalis Hungarici, 1904.

2. Hind-angle of wing sloped away. **Hemerodromiinae**
Hind-angle of wing well developed. 3
3. Anal cell longer than the second basal cell. (In
the aberrant genera *Bicellaria* and *Sciadocera*, in
which it is shorter, the discal cell is wanting.) **Hybotinae**
Anal cell shorter than the second basal cell. 4
4. Proboscis long; the anal cross-vein (i.e., the veinlet
closing the anal cell) strongly recurrent, and be-
coming confluent with the anal vein. **Empinae**
Proboscis short; the anal cross-vein meets the anal
vein at a right angle, or almost so. **Ocydromiinae**

Of the above subfamilies only the three last are at present known to occur in Tasmania, but when the damper parts of the island are properly examined the others are almost certain to be found.

Subfamily Hybotinae.

Two undescribed aberrant genera occur in Tasmania, which probably belong to this subfamily. In one of these, *Ironomyia*, three veinlets arise from the discal cell, instead of two, as in all the other genera in which the discal cell is present; in this character it agrees with the subfamily *Brachystomatinae*, but its other characteristics seem to show more affinity with the *Hybotinae*. The other genus, *Sciadocera*, is very aberrant, and differs from all other genera of the *Hybotinae* in having the eyes in the female widely separated, and in the form of the antennae.

Table of the Tasmanian Genera of Hybotinae.

1. Anal cell longer than the second basal cell. 2
Anal cell shorter than the second basal cell. 3
2. Discal cell emitting three veins; radial vein closely
approximated to the cubital, and extending almost
to the wing-tip. **IRONOMYIA**, Gen. nov.
3. Discal cell wanting; first and second basal cells of
equal length; eyes in female widely separated.
SCIADOCERA, Gen. nov.

51. *IRONOMYIA*, Gen. nov. (Fig. 39.)

Wings with the anal cell longer than the second basal cell; discal cell with three issuing veinlets; radial and cubital veins closely approximated and of almost equal length.



Fig. 39. Wing of *Ironomyia nigromaculata*.

Head broader than the thorax. Eyes (♂) joined from the vertex to the antennæ. Proboscis short, hardly projecting beyond the oral aperture. Palpi rounded, shorter than the proboscis. Antennæ very short, about one-fourth the length of head, the first joint hardly distinguishable, the second a little longer than broad, the third rounded, and provided with a long, thread-like arista, which is apparently jointed almost at its base, the arista being about twice the length of the three antennal joints together. Thorax only slightly arched, with a few weak posterior bristles; scutellum with weak marginal bristles. Abdomen short, conical; male genitalia small and inconspicuous. Legs short, the tibiæ and tarsi of about equal length, the tibiæ thin at the base, but thickening gradually to the apex; all joints practically bare; tarsal claws unusually large, two well-developed pulvilli present, between which are three bristles of equal length. Wings broad, the costa convex and serrated; mediastinal vein fused with the subcostal, which is long, reaching to the sharply-defined stigma; radial vein unusually long, at first well separated from the cubital, after which the two veins converge, almost meeting below the stigma, and then slightly diverge, reaching the margin close together a little above the wing-tip; cubital vein unforked; discal cell long, emitting three veinlets; number of posterior cells four; the three basal cells short, the first a fraction longer than the second, the third a little longer than the first; hind-angle of wing strongly developed.

This remarkable genus may be distinguished at once by its very unusual venation. Only one species is at present known.

IRONOMYIA NIGROMACULATA, Sp. nov. (Fig. 39.)

Thorax and scutellum black; abdomen grey in centre, with a dorsal row of black spots, sides of abdomen black; femora black, with knees yellow; tibiæ yellow, with apex black, and a black ring near the base; wings hyaline, with a clearly-defined yellow-brown stigma.

Length. Male, 4.5 mm.

Hab. Hobart.

Male. Head chiefly occupied by the very large, joined eyes; face small, grey. Antennæ with second joint light brown, third black. Thorax black, with posterior margin grey, the whole bearing scattered, erect, black pubescence, and a few weak, posterior bristles; scutellum brownish-black, with weak black marginal bristles. Abdomen grey dorsally, with a row of black spots extending from the second to the seventh segment; base and sides black; cercum bare, sides with long, soft, pale pubescence. Legs with femora black, knees yellow; tibiæ yellow, with apex black, and a black ring near the base; tarsi with first three joints yellowish, fourth and fifth black; pulvilli yellow, claws black. Wings hyaline, with a clearly-defined yellow-brown stigma.

Of this species I have only met with a single specimen, which occurred settled on a tree trunk at Hobart, on October 5, 1912.

52. SCIADOCERA, Gen. nov. (Fig. 40.)

Wings with the basal cells short, the first and second of equal length, the anal a little shorter; discal cell wanting; cubital vein unforked; discal vein incomplete at the base, and an incomplete veinlet reaching the margin between the cubital and discal veins. Antennæ very short, the terminal joint large, almost quadrangular, and completely concealing the preceding joints; eyes in female widely separated; thorax greatly arched; abdomen short; legs simple.

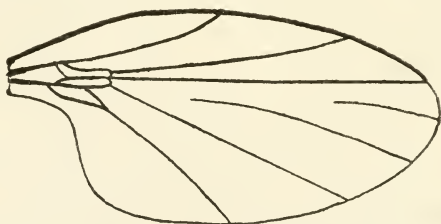


Fig. 40. Wing of *Sciadocera rufomaculata*.

Head placed low down below the greatly-arched thorax. Proboscis concealed within the oral aperture. Eyes in female very widely separated. Antennæ so short that the terminal joint seems to lie directly against the face; it is very large, flattened, almost quadrangular, and provided with a thread-like arista; the terminal joints of the two antennæ touch one another on their inner margins, and reach to the eyes on their outer margins, covering the face, and completely concealing the preceding

joints. Front with six stiff bristles—a divergent pair at the centre of the vertex, a single one on each side close to the eyes, and one lower down above each antenna. Thorax greatly arched, with three complete rows of small dorsal bristles, and well-marked humeral, posthumeral, notopleural, supraalar, and postalar bristles, scutellum with four long marginal bristles. Abdomen about equal in breadth to, but a little longer than, the thorax, altogether without bristles. Legs of medium length, bearing a few bristles, the coxæ considerably lengthened. Wings large, unusually broad, the costa strongly convex; mediastinal and subcostal veins anastomosed, cubital vein unforked; discal vein incomplete at the base, and with an incomplete veinlet above; discal cell wanting; the basal cells short, the first and second of equal length, the anal a little shorter.

The correct position of this curious genus is somewhat doubtful. Notwithstanding the very different venation, I am of opinion that it is allied to the genus *Ironomyia* previously described. The venation resembles that of the genera *Microsania* and *Bicellaria*, particularly the latter, but differs from that genus in having the second basal cell only equal in length to, instead of much longer than, the first basal cell. It differs so much, however, from *Bicellaria* in the form of the antennæ, the widely-separated eyes of the female, and the shape of the wings, that I am doubtful whether the resemblance in venation may not be a misleading one. The genera *Microsania* and *Bicellaria* are placed by Lundbeck in the *Hybotinæ*, by Melander in the *Ocydromiinae*; without wishing to express an opinion as to the correct position of these two genera, I might mention that the new genus now described seems to me to show no relationship whatever with the *Ocydromiinae*, and that if it is referable to any of the existing subfamilies, it can only be placed in the *Hybotinæ*.

Only one species is at present known.

SCIADOCERA RUFOMACULATA, Sp. nov. (Fig. 40.)

Antennæ orange; face, front, thorax, and scutellum orange-brown; abdomen black, the second to fifth segments bearing each two dull orange-red spots; legs yellow; wings hyaline.

Length. Female, 4 mm.

Hab. Mangalore.

Female. Head situated low down below the greatly arched thorax. Face and front orange-brown; frontal

bristles black. Antennæ orange. Thorax and scutellum orange-brown, with black bristles, as described under the generic characters, but quite bare of pubescence. Abdomen with first segment dull orange-red; remaining segments dull black, the second to fifth bearing each two dull orange-red spots; apex with short, black bristles. Legs yellow, with a few scattered black bristles. Wings hyaline, without any trace of a stigma.

This species is easily recognised by the orange-brown thorax, and black abdomen, with ten dull orange-red spots. Only one specimen is known, which was taken by myself on September 25, 1912, in the bush at Mangalore; I searched the same locality for other specimens in succeeding years, but without success.

Subfamily Empinæ.

This subfamily, so far as is known at present, is represented in the Australian region by six genera, all of which, with the exception of *Anthepiscopus*, occur in Tasmania. These genera may be recognised by the long, or fairly long, proboscis, and by the anal cross-vein (i.e., the veinlet closing the anal cell) being strongly recurrent, and becoming confluent with the anal vein.

Table of the Tasmanian Genera of Empinæ.

- | | |
|--|------------------------|
| 1. Cubital vein forked. | 2 |
| Cubital vein not forked. | 4 |
| 2. Mediastinal vein curved up at its end, and meeting the costa; anterior tarsi in male, with the first joint conspicuously dilated. | HILARA, Meig. |
| Mediastinal vein straight, or nearly so, and not meeting the costa. | 3 |
| 3. Anterior tarsi in male with the first joint conspicuously dilated; metapleural bristles wanting. | HILAROPUS, Gen. nov. |
| Anterior tarsi in male not at all, or very slightly, dilated; metapleural bristles present. | EMPIS, L. |
| 4. Cubital vein connected with the radial vein by a cross-vein. | TENONTOMYIA, Gen. nov. |
| Cubital vein not connected with the radial vein. | RHAMPHOMYIA, Meig. |

53. HILARA, Meig. (Fig. 41.)

Anterior tarsi in the male with the first joint conspicuously dilated; mediastinal vein short, curved up at its end, and meeting the costa; length of proboscis about the height of head.

Head about the same breadth or a little narrower than the thorax. Eyes separated in both sexes, very rarely joined in the male. Proboscis in length about the height of head. Antennæ equal in length to or a little longer than the head, the first and second joints short, the third conical, tapering, and terminated by a two-jointed style. Thorax with acrostichal, dorsocentral, and notopleural bristles, and also, usually, a humeral, posthumeral, supraalar, and postalar bristle on each side; metapleura without bristles. Abdomen slender, nearly bare, truncate in male, pointed in female. Legs of medium length, the anterior tarsi in male with the first joint conspicuously dilated, the shape differing in each species. Wings with the mediastinal vein short, curved up at its end, and meeting the costa; cubital vein with a long, narrow fork; discal cell with three issuing veinlets; anal vein weak and generally abbreviated.

The species of *Hilara* occur commonly skimming over the surface of ponds and streams, or, more rarely, over the bare ground. Most of the Tasmanian species are found in the spring time, but one occurs in the late autumn.

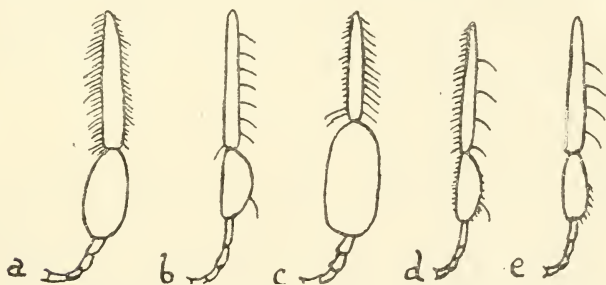


Fig. 41. Right front leg of (a) *Hilara efficiens*, (b) *H. balnearia*, (c) *H. nimia*, (d) *H. nubila*, (e) *H. mollicella*.

Table of the Tasmanian Species of Hilara.

- | | |
|--|---------------------|
| 1. Halteres black or dark brown. | 2 |
| Halteres yellow or very pale brown. | 3 |
| 2. Wings brown; thorax brown, striped; anterior tibiæ in male with uniform short hairs; large, robust species. (Length, 6 mm.) | EFFICIENS, Sp. nov. |
| Wings almost hyaline; thorax black, unstriped; anterior tibiæ in male with very long hairs; small, delicate species. (Length, 3 mm.) | BALNEARIA, Sp. nov. |

3. Anterior tarsi in male with first joint enormously dilated; thorax deep black; wings hyaline.

NIMIA, Sp. nov.

Anterior tarsi in male with first joint not enormously dilated; thorax brown.

4

4. Thorax with two conspicuous black stripes; femora and tibiæ blackish, with yellow knees; wings brownish; spring species. NUBILA, Sp. nov.

Thorax with four faint stripes; femora and tibiæ uniform pale brown; wings practically hyaline; late autumn species.

MOLLICELLA, Sp. nov.

Besides the above species, two species were described by Walker under the names of *Hilara certa* and *Hilara confirmata*, but as I have, unfortunately, been unable to examine Walker's types, I am unable to say to what genus they really belong.

HILARA EFFICIENS, Sp. nov. (Fig. 41a.)

Thorax brown, with two anterior dark brown stripes, and a broader dark brown stripe on each side; scutellum grey, with a fringe of black marginal bristles; abdomen deep brown; anterior and posterior tibiæ in male densely pubescent; wings brown.

Length. Male, 7-8 mm.; female, 6 mm.

Hab. Mangalore, Red Gate.

Male. Face and front black. Eyes rather widely separated. Proboscis about equal in length to height of head. Antennæ blackish, a little longer than the head, the first and second joints short, the third about twice the length of the first two together, and terminated by a long, slender style, which is rather more than half its length. Thorax brown, with two anterior, narrow median, and two broad lateral, dark brown stripes; bristles black, dense, but not particularly long; scutellum grey, with a fringe of eight or more black bristles. Abdomen dark brown, with abundant white lateral pubescence. Legs stout, black; anterior and posterior tibiæ, with very dense brown pubescence; anterior tarsi with the first joint considerably inflated, oval, and about equal in length to the other four joints together. Wings brown, with a dark brown stigma; the mediastinal vein curved up, and meeting the costa; cubital fork long, but not very narrow; anal vein fairly long, but not reaching the wing margin.

Female has the abdomen broader and shorter than in the male, the legs nearly bare, and without any sign of inflation.

This species does not seem so confined to the neighbourhood of water as the other Tasmanian species of *Hilara*, but may be found skimming low over the bare ground. It is generally a common species. My dates range from October 1 to December 31.

HILARA BALNEARIA, Sp. nov. (Fig. 41b.)

Thorax and abdomen black; anterior tibiæ with long, scattered, black, hair-like bristles; wings almost hyaline; halteres dark brown.

Length. Male, 3 mm.

Hab. Hobart, Mangalore.

Male. Face and front black; vertex with long, black bristles. Eyes separated. Proboscis stout, hardly as long as the height of head. Antennæ black, the first and second joints short, the third rather more than twice the length of the first two together, and terminated by a long, slender style, which is a little more than half its length. Thorax black, unstriped, with very long, scattered black bristles; scutellum with four marginal black bristles. Abdomen brownish-black, bare of pubescence, but with short black terminal bristles. Legs dark brown, anterior tibiæ with long, scattered, black, hair-like bristles; anterior tarsi with the first joint considerably inflated, and bearing a single, very long black hair on its inner side. Wings faintly tinged with brown, and bearing a brown stigma: the mediastinal vein short, curved up at its end, and meeting the costa; cubital fork long and narrow, the upper branch nearly as long as the lower; anal vein fairly long, and nearly reaching the wing-margin; halteres dark brown.

This species frequents the neighbourhood of water; it is probably widely distributed, though hardly so common as some of the other species. My dates range from September 24 to November 16.

HILARA NIMIA, Sp. nov. (Fig. 41c.)

Front tarsi in male with the first joint enormously dilated; thorax velvet-black, abdomen brownish-black; wings hyaline; halteres yellow.

Length. Male, 4.5-5 mm.

Hab. Mangalore. (Probably generally distributed.)

Male. Face and front black; vertex with short, black bristles. Eyes separated. Proboscis about the same length as the height of head. Antennæ black, the first and second joints very short, the third a little more than

twice the length of the first two together, and terminated by a slender style, which is rather more than half its length. Thorax with anterior two-thirds velvet-black, posterior third brown; dorsal bristles very short, lateral bristles of medium length; scutellum brown, with four black marginal bristles. Abdomen brownish-black, with posterior margins of segments light brown; sides with both short and long weak, black bristles. Legs black, with the posterior knees narrowly yellow; anterior tibiae with long, black hairs at apex; posterior tibiae with short, widely-separated black bristles; anterior tarsi with the first joint enormously dilated. Wings hyaline, with a brown stigma; the mediastinal vein curved gently up to the costa, which it joins; cubital fork long and narrow; anal vein becoming evanescent at some distance from the wing margin; halteres yellow.

This species may be easily recognised by the enormously dilated front tarsi of the male, and the velvet-black thorax. It occurs abundantly skimming over the surface of pools of water in the early spring time. My dates range from September 1 to October 10.

HILARA NUBILA, Sp. nov. (Fig. 41d.)

Thorax light brown, with two narrow, black longitudinal stripes; legs brownish-black, with posterior knees conspicuously yellow; wings tinged with brown, and with a very conspicuous dark brown stigma; halteres pale whitish-yellow.

Length. Male, 3.5 mm.; female, 3 mm.

Hab. Hobart.

Male. Face and front brown; vertex with black hairs. Eyes separated. Proboscis stout, shorter than the height of head. Antennae with the first and second joints very short, the third slender, about twice as long as the first two together, and terminated by a long style, which is about equal to it in length. Thorax pale greyish-brown, with two narrow black stripes, bounded outwardly by a black spot on either side; dorsal bristles of medium length, lateral bristles long; scutellum pale grey, with four black marginal bristles, the two terminal ones being much the longest. Abdomen deep brown, with weak, black marginal bristles. Legs brownish-black, with posterior knees conspicuously yellow; anterior tibiae with a few long, very widely-separated, black bristles on the inner side; posterior tibiae with a few short, black bristles; anterior tarsi with the first joint long and dilated, and bearing short, black bristles on both sides. Wings brownish, with a very

distinct dark brown stigma; mediastinal vein short, curved up at its end, and meeting the costa; cubital fork long and narrow, the upper branch almost as long as the lower; anal vein long, and almost reaching the wing-margin; halteres pale whitish-yellow.

Female resembles the male, the thorax being similarly striped; abdomen a lighter brown, and produced into a long ovipositor; anterior tarsi not dilated, but the first joint long and slender, in length rather more than that of the remaining four joints together; wings paler than in the male.

This species may be recognised without difficulty by the conspicuously striped thorax. I found it frequenting the rocks in the bed of a mountain stream at Hobart on November 18, 1913; probably it occurs not uncommonly in similar situations.

HILARA MOLLICELLA, Sp. nov. (Fig. 41e.)

Thorax brown, with four faint brown stripes; legs a uniform pale brown; wings practically hyaline, with a faint stigma; halteres light brown; late autumn species.

Length. Male, 3 mm.

Hab. Mangalore.

Male. Face and front black; vertex with black hairs. Proboscis stout, about as long as the height of head. Antennæ short, the third joint twice as long as the first and second together, and terminated by a slightly thickened style, which is nearly equal to it in length. Thorax brown, with four faint, narrow, brown stripes; dorsal bristles of medium length, lateral bristles long; scutellum grey, with four marginal black bristles. Abdomen brown, darkest towards the apex, and bearing a few short, black bristles. Legs a uniform pale brown; anterior tibiæ with a few widely separated black bristles; posterior tibiæ almost bare, but with a few short, black bristles; anterior tarsi with the first considerably dilated, in shape a lengthened oval, about equal in length to the remaining four joints together. Wings practically hyaline, but with a faint brown tinge; the mediastinal vein short, curved up gently at its end, and meeting the costa; cubital fork long and narrow, the upper branch nearly as long as the lower; discal cell more produced above than in *H. nubila*; anal vein nearly reaching the wing margin.

This species differs from all the other known Tasmanian species of *Hilara* by occurring in the late autumn, instead of in the spring time. I have only met with a single specimen, which occurred at the side of a pond at Mangalore, on April 26, 1914.

54. *HILAROPUS*, Gen. nov. (Figs. 42 and 43.)

Small or medium sized flies resembling *Hilara*, but distinguished by the mediastinal vein being straight, incomplete, and not reaching the costa; anterior tarsi in the male with the first joint dilated as in *Hilara*.

Head small, narrower than the thorax. Eyes separated in both sexes. Proboscis varying in length from about the height of head to twice the height of head. Antennæ about the same length, or a little longer than the head. the first joint either short or fairly long, the second always short, the third about as long as the first two joints together, either broad or slender, and terminated by a style which is from a quarter to half its length. Thorax rather arched, with bristles as in *Hilara*, and, in the male, sometimes bearing dense pubescence; metapleural bristles wanting. Abdomen slender in the male, broader in the female, in the former sex sometimes bearing lateral tufts of stiff bristles. Legs either moderately short or elongated, the first joint of anterior tarsi in the male always conspicuously dilated, and the femora and tibiæ in the same sex may be densely hairy. Wings with the mediastinal vein nearly straight, and not reaching the costa; cubital fork either short or fairly long; discal cell with three issuing veinlets, which are all complete; anal vein weak, and not reaching the wing-margin.

The species belonging to this genus resemble those of *Hilara*, both in appearance and in habits, but are distinguished by the straight, incomplete mediastinal vein, which does not reach the costa. From *Empis* the genus is distinguished by the greatly dilated front tarsi of the male, and by the absence of metapleural bristles. From the Tasmanian species of *Empis* it may be further distinguished by the shorter proboscis. Four species are at present known, which seem to fall into two natural groups, as given below.

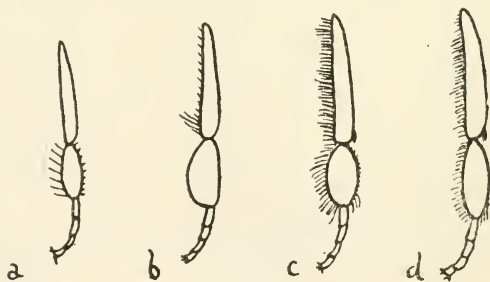


Fig. 42. Right front leg of (a) *Hilaropus pallidifurca*, (b) *H. nigrimanus*, (c) *H. peregrinus*, (d) *H. echinatus*.

This species frequents pools of water like the species of *Hilara*; it seems to be rather uncommon. My dates range from November 17 to November 30.

HILAROPUS NIGRIMANUS, Sp. nov. (Fig. 42b.)

Thorax and abdomen dark brown, the abdomen hairy; front tibiae with long hairs at apex; anterior tarsi in the male with first joint much dilated; wings with veins dark and distinct.

Length. Male, 3-3.5 mm.

Hab. Mangalore.

Male. Face and front black; vertex with long, black bristles. Eyes separated. Proboscis in length about the height of head. Antennae rather longer than the head, the first and second joints very small, the third slender, about twice as long as the first two together, and terminated by a slender style, which is about half its length. Thorax brown, unstriped, thoracic bristles of medium length; scutellum with six marginal bristles, the two middle ones the longest, the two outer short; metapleura without bristles. Abdomen brown, with long, black, lateral pubescence. Legs entirely brownish-black, anterior tarsi with the first joint great dilated; anterior tibiae with a tuft of long, black hairs on the outer side close to the apex; middle and posterior tibiae with a thin fringe of black hairs; posterior femora with scattered black hairs. Wings brownish, the mediastinal vein straight, becoming evanescent at its tip, and not reaching the costa; cubital fork fairly long, but not narrow; veins of wing dark brown and distinct; halteres dark brown.

This species may be met with commonly in the early spring, skimming the surface of pools of water in company with *Hilara nimia*. My dates range from August 17 to September 1, but it probably remains on the wing until a later date.

HILAROPUS PEREGRINUS, Sp. nov. (Fig. 42c and 43.)

Male with thorax velvet-black; abdomen with first segment black, remaining segments covered with pale blue tomentum. Female with thorax pale grey, flushed above with red, and bearing four very distinct black stripes, the two median ones narrow, the two lateral ones broad, and interrupted in the middle; abdomen black, with only a faint trace of the blue tomentum of the male. Halteres yellow.

Length. Male, 6-7 mm.; female, 7 mm.

Hab. Bagdad Valley. (Probably generally distributed.)

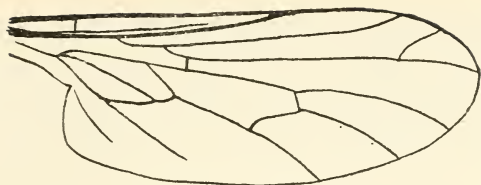


Fig. 43. Wing of *Hilaropus peregrinus*.

Male. Face grey. Front with lower third grey, upper two-thirds black. Proboscis a little longer than the height of head. Palpi a little less than half the length of the proboscis, light brown, with long, pale yellow hairs. Antennæ brownish black, about as long as the head, the first joint twice the length of the second; the third thickened, about twice as long as the first two together, and terminated by a short style, which is about one-quarter its length. Thorax velvet-black, bearing dense black pubescence; only the posterior lateral bristles well-defined; scutellum velvet-black, with a fringe of numerous long, weak, black marginal bristles. Metapleural bristles wanting. Abdomen somewhat conical; first segment black, remaining segments covered with pale blue tomentum, all segments bearing lateral tufts of black bristles; genitalia black, large, and rising well above the level of the abdomen. Legs black, with the knees narrowly orange; front tarsi with the first joint much dilated, and bearing a fringe of hairs outwardly; the first joints of the middle and posterior tarsi are also somewhat swollen; anterior and middle tibiae clothed with long, black hairs; posterior tibiae with very long yellow and black hairs; posterior femora with very long yellow hairs below, and black hairs above. Wings rather short, tinged with brown, and with a brown stigma; mediastinal vein nearly straight, and not reaching the costa; cubital fork broad, the upper branch much shorter than the lower; discal cell with three issuing veinlets, which are all complete; wing-veins dark brown and strongly marked; halteres light brownish-yellow.

Female differs so much from the male that it might well be mistaken for a distinct species. The front is entirely grey. Thorax pale grey, the centre of the dorsum flushed with red, and with four very distinct black stripes, the two median ones narrow and entire, but not reaching to the posterior margin, the two lateral ones broad, and interrupted in the middle; scutellum pale grey, with marginal bristles as in the male. Abdomen black, with faint traces laterally and posteriorly of the pale blue tomen-

tum of the male. Legs with all joints simple, and practically bare. Wings as in the male.

The present species, so far as the male is concerned, is easily recognised by the velvet-black thorax and pale blue abdomen; the female, however, closely resembles those of both *Empis bellatorius* and *Hilara efficiens*, and as the females of these three species are very liable to be confused, it may be as well to point out the distinguishing characters. *Hilara efficiens* is distinguished from the other two species by the short, upturned mediastinal vein which meets the costa, whilst *Empis bellatorius* is distinguished by the long proboscis, light brown legs, and thorax with two faint grey stripes, *Hilaropus peregrinus* by the shorter proboscis, black legs, and thorax with four very distinct black stripes.

Hilaropus peregrinus is a common spring species. Both sexes may be seen skimming over the surface of ponds and streams, and sometimes over the bare ground, and may also be met with resting on bracken. My dates range from October 16 to November 7.

HILAROPUS ECHINATUS, Sp. nov. (Fig. 42d.)

Thorax black; abdomen black, with white, tomentose, lateral, hindmarginal spots on each segment, and tufts of very long lateral bristles; legs entirely black; halteres black.

Length. Male, 9 mm.

Hab. Mangalore.

Male. Face and front black. Proboscis about one-and-a-half times the height of head. Palpi short, about one-quarter the length of the proboscis, grey, bearing long yellow hairs. Antennæ black, about the length of the head, the first and second joints short, the third expanded, about twice as long as the first two together, and terminated by a short style, which is about one-third its length. Thorax velvet-black, with two very indistinct pale stripes, the whole bearing dense black pubescence; scutellum velvet black, with a fringe of numerous very long, weak, black bristles; metapleural bristles wanting. Abdomen black, with white tomentose lateral spots on the posterior margins of each segment, the sides with tufts of long, black bristles; genitalia black, hardly rising above the level of the abdomen. Legs black, the first joint of anterior tarsi long and moderately thickened; all femora and tibiæ with dense pubescence, but this is not nearly so long as in *H. peregrinus*. Wings brownish, the mediastinal vein straight, and not reaching the costa; cubital

fork very small; all veins dark brown, and strongly marked; halteres black.

This is the largest and finest known species of the Tasmanian *Empidæ*. It bears some resemblance to *H. peregrinus*, but may be easily distinguished by its black and more bristly abdomen, its less dilated front tarsi, and black halteres.

H. echinatus seems to be a scarce species; the only specimens that I have met with were skimming over the surface of a rock-pool in the bush, on November 29, 1914.

55. *EMPIS*, L. (Fig. 44.)

Proboscis long; mediastinal vein incomplete, and not reaching the costa; metapleura with bristles; anterior tarsi in male not dilated.

Head small, globular, narrower than the thorax. Proboscis always elongated. Eyes either touching or separated in the male, always separated in the female. Antennæ with the first two joints short, the third elongated and somewhat conical, with a short terminal style. Thorax rather arched, with, usually, dorsocentral, acrostichal, humeral, posthumeral, notopleural, supraalar, and postalar bristles, but some of these may be wanting; metapleura with bristles. Abdomen long and slender, truncate in the male, pointed in the female. Legs slender, the posterior pair sometimes elongated; posterior tarsi in the male sometimes slightly inflated, tibiæ and tarsi in the female sometimes feathered with scaly hairs. Wings occasionally broader in the female than in the male; mediastinal vein incomplete, and not reaching the costa; cubital vein forked, the upper branch usually short and nearly upright, seldom so sloping as in *Hilara*; the discal cell with three issuing veinlets, of which the upper one is occasionally abbreviated; anal vein either complete or shortened; anal cell much shorter than the second basal cell.

The species of *Empis* may be met with frequenting flowers, or settled on vegetation, whilst a few are found hovering in the air. None of the species skim over the surface of water, like those of *Hilara* and *Hilaropus*.

The genus *Empis* contains a large number of species from all parts of the world. It has been divided into a number of subgenera by Bezzi, but with our present small knowledge of the Australian species, it is impossible to say how far these apply to the Australian region. Up to the present time, six species have been described from Australia, but, according to Bezzi, it is doubtful whether some of these may not belong to *Hilara*. From Tasmania

only one species has been described; this species, *E. brevirostris*, was described by Macquart from a single female; it is not typical of the genus, and in the absence of a specimen of the male, it is impossible to be certain as to its exact position. Excluding this species, four typical species are now known to occur in Tasmania; all these have the proboscis lengthened, the length varying from two to three times the height of head.

Table of the Tasmanian Species of Empis.

1. Posterior legs elongated; tibiæ of the male apically inflated; eyes joined in male. 2
Posterior legs not elongated; tibiæ not inflated; eyes separated in both sexes. 3
2. Thorax dark grey, with two pale grey stripes; femora black, with the base yellow; wings brown. BELLATORIUS, Sp. nov.
3. Thorax orange; abdomen brown; femora reddish-yellow; wings tinted with brown. SERICATUS, Sp. nov.
Thorax black or blackish. 4
4. Abdomen black, with hindmargins of segments yellow; femora black; tibiæ light brown; wings clear, without a stigma; cubital fork long; medium-sized species (length 6 mm.) AQUILUS, Sp. nov.
Abdomen black; femora and tibiæ a uniform olive-brown; wings with a stigma; cubital fork short; very small species (length, 3 mm.) FLABILIS, Sp. nov.

EMPIS BELLATORIUS, Sp. nov.

Thorax dark grey, with two median pale grey stripes; abdomen black; femora black, the posterior pair with basal third yellow, anterior and middle pairs with only extreme base yellow; anterior and middle tibiæ yellow; posterior tibiæ black in male, yellow, with apex black, in female; wings brown, with a dark brown stigma.

Length. Male, 6 mm.; female, 7 mm.

Hab. Bagdad Valley. (Probably generally distributed.)

Male. Face black; proboscis in length about twice the height of head. Eyes joined, occupying the whole front. Antennæ black, the third joint elongated, nearly three times as long as the first and second joints together, and terminated by a long, pointed style, which is about half its length. Thorax dark grey, with two very distinct, pale

grey median stripes, which extend from the anterior margin to the middle of the dorsum, and with long, black lateral and posterior bristles; scutellum with six black marginal bristles. Abdomen brownish-black, with white lateral pubescence; genitalia very large, almost orbicular. Legs with the posterior pair lengthened; all femora slender; posterior tibiæ thickened gradually from base to apex; anterior tarsi with first joint slightly thickened; femora black, the posterior pair with basal third yellow, anterior and middle pairs with only extreme base yellow; anterior and middle tibiæ yellow, posterior tibiæ black, with knees yellow; tarsi black, the first joint of anterior and middle pairs with basal two-thirds yellow, of posterior pair with only extreme base yellow; the anterior tibiæ bear outwardly short, black pubescence of uniform length, the middle tibiæ a comb of extremely long black hairs, the posterior tibiæ both short, and a few very long, black bristle-like hairs, which are densest at the apex. Wings brown, with a dark brown stigma; the mediastinal vein rather long, and nearly reaching the costa; cubital vein curved downwards, the upper branch of fork curved outwards towards the tip; discal cell truncate, the three issuing veinlets complete; anal vein not quite reaching the wing margin.

Female resembles the male very closely, but the eyes are separated, the thorax a paler grey, which makes the two pale grey anterior stripes less distinct, and the abdomen long and pointed. The pubescence on the legs is more uniform, that on the anterior and middle tibiæ being of almost equal length, that on the posterior tibiæ very short, with a row of widely-separated long black bristles.

E. bellatorius is a common species in the bush in the early spring time. It hovers in small flocks in the air, and seems to be of inquisitive habits, as it will approach and hover round the head of anyone who stops to watch it. My dates range from September 3 to September 25, but probably it remains on the wing until a somewhat later date.

EMPIS SERICATUS, Sp. nov. (Fig. 44.)

Thorax and scutellum orange; abdomen orange-brown or dark brown; femora, tibiæ, and tarsi yellow, with apices of all joints darkened; wings tinged faintly with brown, stigma faint, yellow-brown.

Length. Female, 6 mm.

Hab. Mangalore.

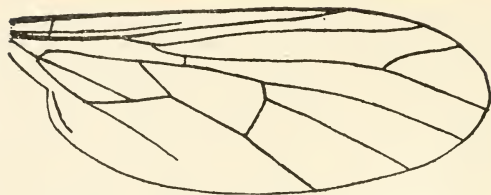


Fig. 44. Wing of *Empis sericatus*.

Female. Face and front brown. Proboscis a little more than three times the height of head. Antennæ black, the first joint about twice the length of the second, the third three times as long as the first two together, and terminated by a thin pointed style, which is about one-third its length. Thorax orange, almost bare of pubescence, but with very long, black, lateral, and posterior bristles; scutellum with two long, black, marginal bristles; metapleural bristles black, fan-like. Abdomen dark brown, with ovipositor yellow-brown, almost bare, but basal segments with a few black lateral bristles. Legs simple, femora, tibiæ, and tarsi yellow, with apices of all joints blackish, the whole almost bare of pubescence, but with numerous short black bristles. Wings tinged faintly with brown, and with a very faint, yellow-brown stigma; mediastinal vein short and incomplete; cubital fork long, the upper branch more than half the length of the lower; discal cell short, truncate; anal vein indistinct, and not quite reaching the wing-margin; halteres yellow.

This species may be easily recognised by its orange thorax. It occurred fairly commonly on low vegetation in the garden of my house at Mangalore. My dates range from October 11 to November 6.

EMPIS AQUILUS, Sp. nov.

Thorax black, with two brown median stripes, bordered outwardly with brown tomentum; scutellum black, with outer margin brown; abdomen black, with hindmargins of segments brownish yellow; femora brownish black; tibiæ and tarsi light brown; wings absolutely hyaline, without any sign of a stigma.

Length. Male, 6 mm.

Hab. Mangalore.

Male. Face and front brown. Eyes widely separated. Proboscis in length almost three times the height of head. Antennæ black, the first joint about twice the length of the second, the third about three times as long as the first two together, and provided with a slender style,

which is about one-third its length. Thorax black, with brown tomentum on sides, and two narrow brown median stripes, and bearing long, black, lateral and posterior bristles; scutellum black, with outer margin brown, and two long, black marginal bristles; metapleural bristles black. Abdomen black, with hindmargins of all segments brownish-yellow, and lateral hindmarginal black bristles. Legs short, without any sign of inflation; femora brownish-black, with sparse black pubescence; tibiæ light brown, the anterior pair with rather short black pubescence, middle pair with both short black pubescence and a few very long bristle-like hairs, posterior pair with stiff black bristles; tarsi brown, with tips blackish. Wings absolutely hyaline, venation as in *E. sericatus* (see fig. 44); mediastinal vein short and incomplete; cubital fork long, the upper branch more than half the length of the lower; discal cell short, truncate, the three issuing veinlets complete; anal vein short, and not nearly reaching the wing-margin; halteres pale brown.

This species is closely allied to *E. sericatus*, but is easily distinguished by its different colouration. It occurred sparingly in the garden of my house at Mangalore during the month of November.

EMPIS FLABILIS, Sp. nov.

Thorax and abdomen black; legs a uniform brownish-black; wings hyaline, with a brown stigma; lower branch of the cubital fork in a line with the stem, and not curved downwards, upper branch short; a very small species, with palpi unusually conspicuous.

Length. Male and female, 3 mm.

Hab. Mangalore.

Male. Face and front black; eyes separated. Proboscis in length nearly three times the height of head. Palpi unusually conspicuous, a little less than the length of head, the two joints of almost equal length, the second slightly knobbed at apex, and terminated by a long hair. Antennæ black, rather broad, the first and second joints short, the third about twice as long as the first two together, and provided with a short, slender style, which is about one-third its length. Thorax black, with short anterior and long posterior bristles; scutellum with four marginal black bristles. Abdomen black, the segmentations indistinctly marked with white, nearly bare, but with a little short, black lateral pubescence. Legs with femora, tibiæ, and tarsi a uniform brownish-black, with black pubescence. Wings hyaline, with a brown stigma;

mediastinal vein short and incomplete; cubital vein with a short fork, the lower branch in a line with the stem, and not curved downwards, upper branch short; discal cell truncate, the three issuing veinlets complete; anal vein incomplete, hardly extending beyond the anal cell.

Female has the posterior tibiae broader, and first joint of posterior tarsi narrower, than in the male, and the abdomen is produced into a long ovipositor; otherwise it resembles the male very closely.

This species is easily distinguished from all the other known Tasmanian species of *Empis* by its very small size, whilst the very long proboscis will at once distinguish it from similar species of *Hilara*.

E. flabilis frequents flowering heaths in the bush in the early spring time. It is apparently local, but probably common where it occurs. I have only met with it during the month of September.

56. TENONTOMYIA, Gen. nov. (Fig. 45.)

Wings with the cubital vein simple, but connected with the radial vein by a cross-vein; antennae with a very long aristiform style; proboscis less in length than the height of head, and bearing long hairs; legs very slender and quite simple.

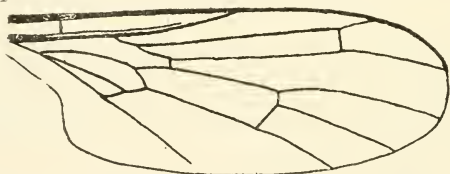


Fig. 45. Wing of *Tenontomyia gracilipes*.

Head a little narrower than the thorax. Proboscis thick, a little shorter than the height of head, and bearing long hairs. Eyes separated in both sexes. Antennae with the first and second joints extremely small, the third expanded, nearly oval in shape, and drawn out at the apex into a narrow point, from which springs a long aristiform style, which is about twice as long as the three antennal joints together. Palpi not distinguishable. Thorax considerably arched, dorsum almost bare, but with a few long lateral and posterior bristles; scutellum with marginal bristles. Abdomen with short, lateral bristles; genitalia of the male narrow, but lengthened. Legs long, particularly the posterior pair, and very slender, all joints simple, and practically bare of either bristles or pubescence. Wings of medium size; mediastinal vein straight,

and apparently becoming coalescent with the subcostal; radial and cubital veins simple, but connected by a perpendicular cross-vein; discal cell nearly triangular, with three issuing veinlets, which are all complete; anal vein indistinct, but reaching the wing-margin; first basal cell slightly longer than the second, the second slightly longer than the third.

This genus may be recognised by the very distinct venation, also by the unusually long antennal style. Only one species is at present known.

TENONTOMYIA GRACILIPES, Sp. nov. (Fig. 45.)

Thorax light brown; abdomen dark brown, with black lateral bristles; femora, tibiæ, and tarsi light brown, the tarsi apically darkened; wings tinged with brown, and with a light brown stigma.

Length. Male, 5.5 mm.

Hab. Mangalore and Northern Tasmania.

Male. Face and front brown. Proboscis orange-brown, thickened, and a little shorter than the height of head. Eyes separated. Antennæ black, of the form described under the generic characters. Thorax light brown, unstriped, devoid of pubescence, but with two rows of fairly long black dorsocentral bristles, and long black lateral bristles; scutellum with four black marginal bristles. Abdomen dark brown, with a few black lateral hindmarginal bristles. Legs very slender, bare, light brown, with the tarsi apically darkened. Wings with the venation described under the generic characters, tinged with brown, and with a pale brown stigma.

Of this species I have personally only come across a single specimen, which occurred in the bush at Mangalore on September 25, 1912, but Mr. Littler has kindly sent me for examination several specimens from Northern Tasmania, so the species is probably more common in that part of the island.

57. *RAMPHOMYIA*, Meig. (Fig. 46.)

Proboscis long; wings with the cubital vein unforked, and not connected with the radial by any cross-vein.

Head small and almost globular. Eyes either joined or narrowly separated in the male, always separated in the female. Antennæ with the first two joints short, the third conical and provided with a short style. Thorax rather arched, with or without bristles. Abdomen slender, consisting of eight segments; genitalia of male varying con-

siderably in the different species; ovipositor of female long and produced. Legs slender. Wings with the medial vein not reaching the costa; cubital vein unforked; discal cell varying much in shape and length, but with always three issuing veinlets; stigma usually present.

This genus is represented in Tasmania by two small, delicate species, which are liable to be overlooked. It has not previously been recorded from the Australian region.

Table of the Tasmanian Species of Rhamphomyia.

1. Wings with a distinct stigma; the three veins issuing from the discal cell do so almost in a line, at a nearly equal distance from the base of wing, the end of the discal cell being almost rectangular; autumn species. APRILIS, Sp. nov.
2. Wings with a faint stigma; the lowest veinlet issuing from the discal cell does so much nearer the base of wing than the two above, the discal cell being drawn out above into a long point; spring species. SEPTEMBRIS, Sp. nov.

RHAMPHOMYIA APRILIS, Sp. nov. (Fig. 46.)

Thorax and abdomen grey; legs black; wings with a distinct stigma; the three veins issuing from the discal cell do so almost in a line, at a nearly equal distance from the base of wing, the end of the discal cell being almost rectangular; autumn species.

Length. Male, 3 mm.

Hab. Mangalore.

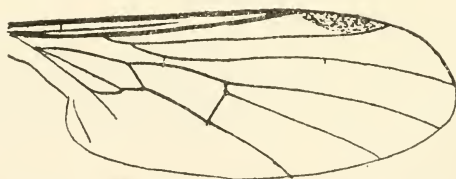


Fig. 46. Wing of *Rhamphomyia aprilis*.

Male. Face and front black. Proboscis about equal in length to height of head. Palpi pale yellow, about two-fifths the length of the proboscis. Antennæ about the same length as the head, the first and second joints very short, the third thickened at the base, and tapering gradually to the apex, twice as long as the two first joints together, and terminated by a long style, which is fully half its length. Thorax grey, with short, stiff, median, and

a few longer lateral, bristles; scutellum with four black marginal bristles. Abdomen grey, with white lateral pubescence; genitalia rising considerably above the level of the abdomen. Legs black, femora and tibiæ with short bristles. Wings hyaline, with pale yellow-brown veins, and a distinct stigma; cubital vein simple; discal cell with three complete issuing veinlets, which leave it almost in a line, at a nearly equal distance from the base of wing, the end of the discal cell being almost rectangular; anal vein very short, hardly extending beyond the anal cell.

Of this species I came across several specimens dancing in the air, near a small stream at Mangalore, on April 19, 1914, but have not met with it on any other occasion; it is evidently a late autumn species, and from its small size is liable to be overlooked.

RHAMPHOMYIA SEPTEMBRIS, Sp. nov.

Thorax and abdomen grey; legs brown; wings with a faint stigma; the lowest veinlet issuing from the discal cell does so much nearer the base of wing than the two upper ones, the discal cell being drawn out above into a long point; spring species.

Length. Female, 3 mm.

Hab. Mangalore.

Female. Face and front brown. Proboscis long, in length nearly twice the height of head. Palpi not distinguishable. Antennæ black, about the length of head, the first and second joints short, the third rather more than twice as long as the first two together, and terminated by a style which is nearly half its length. Thorax grey, dorsum nearly bare, but with long lateral bristles; scutellum with four long black, almost upright, bristles. Abdomen grey, nearly bare, but with a little whitish lateral pubescence. Legs dark brown, with the knees very narrowly yellow, all joints bearing very small bristles. Wings hyaline, with dark brown veins, and a faint brown stigma; discal cell drawn out into a long point above, so that the lowest issuing veinlet does so much nearer the base of wing than the two upper ones; anal vein continued well beyond the anal cell, but becoming obsolete half-way to the wing-margin.

This species bears a close resemblance to *R. aprilis*, but is distinguished by the different form of the discal cell, by the longer proboscis, and by the darker veins of the wings; it is also a spring instead of an autumn species.

R. septembris seems to be rare, but may merely have been overlooked. I have personally only come across a

single specimen, which occurred settled on vegetation at Mangalore, on September 13, 1914.

Subfamily *Ocydromiinae*.

This subfamily is very nearly allied to the *Empinae*, and in some cases it is difficult to draw a line of distinction between them. The *Ocydromiinae*, however, can usually be recognised by the anal cross-vein meeting the anal vein at more or less a right-angle, and not becoming confluent with it. Two genera, both of very wide distribution, are known to occur in Tasmania.

Table of Tasmanian Genera of Ocydromiinae.

1. Antennæ with a long arista. 2
2. Discal cell with three issuing veinlets.

MICROPHORUS, Macq.

Discal cell with only two issuing veinlets.

LEPTOPEZA, Macq.

58. MICROPHORUS, Macq. (Fig. 47.)

Proboscis not longer than the height of head. Antennæ with the third joint attenuated beyond a broad base, and terminated by a long arista. Wings with the cubital vein unforked; discal cell with three issuing veinlets, which are all complete; anal cross-vein rounded and slightly recurrent; anal vein continued only a short distance beyond the anal cell.

To this genus I ascribe provisionally a Tasmanian species, which seems to come nearer to it than to any other genus, although it is not quite typical. It differs principally in the much longer antennal style, but agrees in the form of the anal cell, and the incomplete anal vein, although the latter extends well beyond the anal cell.

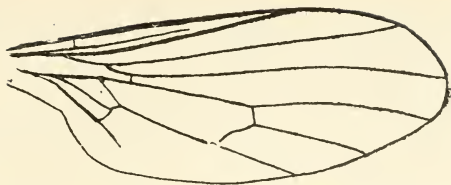
The genus *Microphorus* is placed by Lundbeck in the *Ocydromiinae*, by Melander in the *Empinae*. Personally, it seems to me to be intermediate between these two subfamilies, though I think that its affinities are nearest to the *Ocydromiinae*.

MICROPHORUS HIEMALIS, Sp. nov. (Fig. 47.)

Antennæ black, front pale grey; thorax pale brown, with two narrow dark brown stripes; abdomen brown; legs entirely light brown; wings hyaline, with veins yellow-brown.

Length. Female, 3 mm.

Hab. Mangalore.

Fig. 47. Wing of *Microphorus hiemalis*.

Female. Face and front pale grey. Proboscis a little shorter than the height of head. Palpi very short, less than one-fourth the length of the proboscis. Antennæ—without the style—about half the length of head, the first two joints very small, the third with a broad base and pointed apex, terminated by a long aristiform style, which is a little longer than the three joints together. Front with ocellar and vertical bristles. Thorax pale brown, with two narrow, dark brown stripes, bearing long dorsal and lateral bristles; scutellum with two black, erect, marginal bristles. Abdomen brown; ovipositor brownish-yellow. Legs entirely light brown, without any distinct bristles. Wings hyaline, with a brownish tinge, without any trace of a stigma; halteres yellowish-white.

This species bears some resemblance to the species of *Rhamphomyia* already described, but may be distinguished by the long aristiform style. It is a winter species, frequenting low vegetation during the month of July.

59. LEPTOPEZA, Macq. (Fig. 48.)

Antennæ with a long arista; discal cell with only two complete issuing veinlets, though a third short, incomplete one is also sometimes present.

Head a little narrower than the thorax. Proboscis short, hardly extending beyond the oral aperture. Eyes joined in both sexes, though sometimes only touching below the antennæ. Antennæ a little longer than the head, the first and second joints of almost equal length, the third about twice the length of the first two together, and terminated by a long arista, which varies in length from that of the third joint to one-and-a-half times the length of the three joints together. Thorax much arched, usually bearing acrostichal and dorsocentral bristles, also a notopleural, a postalar, and, more rarely, a supraalar bristle; scutellum with two or more marginal bristles. Abdomen slender. Legs either nearly bare, or distinctly hairy or bristly. Wings with the mediastinal vein incomplete, cubital vein unforked, anal vein sometimes very

faint; discal cell with normally two issuing veinlets, but more rarely there is in addition a short, incomplete one, leaving the cell above the other two.

The flies comprised in this genus are small, delicate insects, which may usually be found resting on vegetation. In Tasmania five species are known to occur, two of which are identical with species described by Bezzi from New South Wales.

Table of the Tasmanian Species of Leptozepe.

1. Discal cell with a third short issuing veinlet; thorax orange, with two black posterior spots; abdomen black. BIMACULATA, Bezzi.
Discal cell with only two issuing veinlets. 2
2. Thorax orange, unspotted; abdomen black. RUBRITHORAX, Sp. nov.
Thorax black or grey. 3
3. Legs yellow; posterior femora banded with dark brown before the apex; legs very bristly. PULCHERRIMA, Bezzi.
Posterior femora not banded. 4
4. Femora and tibiæ entirely light yellow, without any sign of darkening; posterior femora with only a few short apical bristles; costa of wings not bristly; anal cross-vein distinct. LEVICOSTA, Sp. nov.
Legs yellow, but with the femora darkened above; posterior femora with numerous long bristles; costa of wings bristly; anal cross-vein indistinct. SERRATICOSTA, Sp. nov.

LEPTOZEPE BIMACULATA, Bezzi.

Thorax orange, with two black, rounded posterior spots; abdomen brownish-black; legs yellow, with the knees narrowly black; wings hyaline, with a brown stigma; the discal cell with an incomplete issuing veinlet above the other two.

Length. Male, 3 mm.

Hab. Hobart.

Male. Face black. Proboscis brown. Antennæ black, distinctly longer than the head, the first and second joints very short, the third narrow and lengthened, about four times as long as the first two together, and terminated by an arista which is about two-thirds its length. Thorax orange, with two black, rounded, posterior spots; scutellum orange, with two long black terminal bristles. Abdo-

men bare, dark brown, or brownish-black, the basal and apical segments being the darkest. Legs with femora and tibiæ pale yellow, with knees black, the femora with also a faint blackish banding before the apex; femora shortly spinose beneath; all tibiæ with two black bristles; tarsi brownish. Wings hyaline, with a brown stigma; the discal cell with a short, incomplete veinlet above the two usual complete ones.

This species was described by Bezzi from a male taken at Mount Victoria, New South Wales. In Tasmania I have only met with it at the Cascades, Hobart, where it is probably not uncommon; time of occurrence, October.

LEPTOPEZA RUBRITHORAX, Sp. nov.

Thorax dark orange, unspotted; abdomen black, indistinctly reddish at the base; femora and tibiæ very hairy, yellow, the tibiæ brown at apex; wings hyaline.

Length. Female, 4.5 mm.

Hab. Hobart.

Female. Face and proboscis black. Eyes joined. Antennæ black, the first and second joints short, the third about three times as long as the first two together, and terminated by an arista which is about equal to it in length. Thorax dark orange, unspotted, bare, with a long and a short notopleural bristle, and a long postalar bristle; scutellum similarly coloured to the thorax, with six black marginal bristles, the two middle ones being the longest. Abdomen black, indistinctly reddish at the base; ovipositor long, yellow, with apex black. Legs yellow, the tibiæ and tarsi apically darkened; both femora and tibiæ are very hairy, the former being also spinose beneath. Wings hyaline, without any distinct stigma; cubital vein strongly waved; discal cell with two issuing veinlets; halteres pale whitish yellow.

This species may be distinguished without difficulty by the uniform dark orange thorax. I have only come across a single specimen, which occurred at the Cascades, Hobart, on October 4, 1912.

LEPTOPEZA PULCHERRIMA, Bezzi.

Thorax shining black; abdomen brownish-black, the three basal segments with sides and segmentations yellow; legs bristly, yellow, the posterior femora with a dark brown band shortly before the apex; wings hyaline.

Length. Male, 4.5 mm.

Hab. Mangalore.

Male. Eyes joined. Antennæ distinctly longer than the head, the first and second joints short, the third rather more than twice as long as the first two together, and terminated by an arista which is longer than the three antennal joints together. Thorax shining black, with long lateral bristles; scutellum grey, with two long, black, terminal bristles. Abdomen brownish-black, the three basal segments with sides and segmentations yellow, the whole bearing long white pubescence. Legs yellow, the posterior femora with a dark brown band shortly before the apex; posterior tibiæ with middle and apex brown; tarsi with apices of segments brown; front legs almost bare; middle and posterior femora and tibiæ with long black bristles. Wings hyaline, with a brown stigma; discal cell large, with two issuing veinlets; anal vein curved, distinct and continued far beyond the anal cell; anal cross-vein short, and not quite reaching the anal vein, thus leaving the anal cell slightly open.

This species was described by Bezzi from a female taken at Mount Victoria, New South Wales. In Tasmania I have only taken it high up in the hills that bound the Bagdad Valley on its eastern side, so the species is probably a mountain one. My dates range from November 3 to March 16.

LEPTOPEZA LEVICOSTA, Sp. nov. (Fig 48.)

Thorax grey; abdomen shining black; legs yellow, without any sign of darkening; posterior femora with only a few short apical bristles; wings with the costa not bristly, and the anal cross-vein distinct.

Length. Male, 3 mm.; female, 3.5 - 4 mm.

Hab. Mangalore.

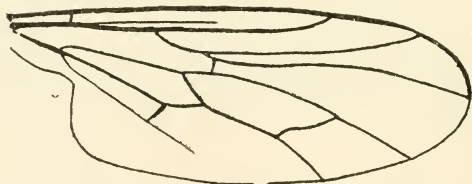


Fig. 48. Wing of *Leptopeza levicosta*

Male. Proboscis black, stout, short, but protruding well beyond the oral aperture; palpi pale yellow, very short. Antennæ black, longer than the head, the first and second joints short, the third about three times as long as the first two together, and terminated by an arista, which

is about equal to it in length. Thorax grey, almost bare, but with two notopleural and one postalar bristles on each side; scutellum with two long, black, upright, terminal bristles. Abdomen shining black, bare. Legs entirely yellow, without any sign of darkening; posterior femora with a few small black apical bristles; anterior tibiae with one, middle tibiae with about two, and posterior tibiae with several, long black bristles; tarsi apically darkened. Wings with the costa not bristly; discal cell with two issuing veinlets; anal cross-vein distinct, but anal vein faint; halteres pale yellow.

Female resembles the male very closely, but the abdomen is produced into a long, narrow ovipositor.

This species seems to be fairly common. The male I have taken on wattle blossom, the females frequenting low vegetation and on a window. My dates range from September 22 to November 1.

LEPTOPEZA SEERATICOSTA, Sp. nov.

Thorax grey; abdomen shining black; legs yellow, with the femora darkened above; posterior femora with numerous long bristles; costa of wings bristly; anal cross-vein indistinct.

Length. Male, 2.75 mm.

Hab. Mangalore.

Male. Proboscis extending slightly beyond the oral aperture; palpi very short, whitish. Antennæ a little longer than the head, the first and second joints very short, the third about three times as long as the first two together, a little expanded at the base, and tapering gradually to the apex, and terminated by a slightly shorter arista. Thorax grey, with one humeral, two notopleural, one supraalar, and two postalar bristles on each side; scutellum with black marginal bristles. Abdomen shining black, bare, genitalia very large. Legs yellow, the femora darkened above, all joints more or less bristly; posterior femora with numerous long, black bristles; anterior tibiae with about two, middle and posterior tibiae with numerous, long black bristles. Wings hyaline, with the costa bristly; discal cell with two issuing veinlets; both the anal cross-vein and anal vein very faint.

This species is remarkable for the fact that it occurs during the winter; it frequents low vegetation in the bush during the first half of July, and though probably not uncommon is apt to be overlooked.

Family X. DOLICHOPODIDÆ.

Head about the same width as the thorax; the vertex more or less excavated. Eyes usually separated in both sexes, but sometimes joined below the antennæ in the male; only joined above the antennæ in the genus *Diaphorus*. Proboscis short and fleshy; palpi very short, usually resting on the proboscis. Antennæ consisting of three joints and an arista, the first two joints always short, the third either short or long, the arista usually much longer than the three antennal joints together, but sometimes short, and occasionally differing in length in the two sexes, and its position may be either apical, subapical, dorsal, or basal. Thorax bristly, with short, but well defined, acrostichal bristles, which may be either uniserial or biserial, dorso-central, humeral, posthumeral, presutural, postalar and supraalar bristles also usually present; scutellum with from two to six marginal bristles. Abdomen conical or long and cylindrical, frequently bearing lateral bristles. Legs usually of moderate length, but sometimes elongated, and, in the male, frequently exhibiting some ornamental structure. Wings with the second basal cell and the discal cell united; anal cell very short; mediastinal vein short, and usually united with the subcostal, which is also short; discal vein usually simple, but occasionally forked; wings either hyaline or banded, but never with any trace of a stigma.

Most of the flies belonging to this family are partly or altogether metallic green in colour, but this may be varied with metallic blue, grey, or violet; even the most soberly-coloured species usually exhibit at least a metallic tinge. Frequently a great difference exists between the two sexes, and owing to this fact, and also because the chief generic and specific distinctions are shown by the male, I have, with the exception of the unmistakeable genus *Sciapus*, only described those species in which the male is known to me. This gives a total of twelve Tasmanian species, but this number is likely in the future to be greatly increased.

Table of the Tasmanian Genera of Dolichopodidæ

- | | |
|--|------------------------|
| 1. Discal vein forked | SCIAPUS, Zell. |
| Discal vein not forked. | 2 |
| 2. Legs extremely long and slender; eyes in male
joined for a short distance below the antennæ. | ARACHNOMYIA, Gen. nov. |
| Legs comparatively short. | 3 |

3. Eyes in the male joined above the antennæ; third antennal joint short, usually broader than long, with arista dorsal or subapical.

DIAPHORUS, Meig.

Eyes separated in both sexes.

4

4. Last part of postical vein (i.e., the part from the discal cell to the wing-margin) much longer than the posterior cross-vein; antennæ in male with the third joint elongated, with the arista arising almost from its base. LIPAROMYIA, Gen. nov.

Last part of postical vein not longer than the posterior cross-vein; antennæ with the third joint rounded and the arista dorsal.

HYDROPHORUS, Fall.

60. SCIAPUS, Zell. (Fig. 49.)

(*Psilopus*, Meig.)

Slender metallic flies, having the discal vein forked, the upper branch distinct, and often bent or angulated in the middle, the lower straight and indistinct; posterior cross-vein (i.e., the veinlet closing the discal cell) straight, waved, or angulated.

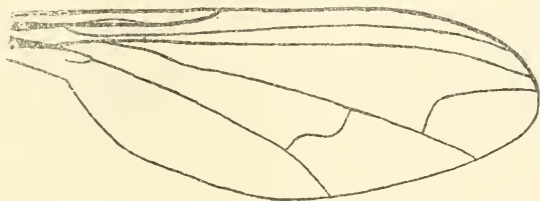


Fig. 49. Wing of *Sciapus chalcus*.

Head as broad or broader than the thorax; vertex rather deeply excavated. Eyes large, separated in both sexes. Antennæ situated a little above the middle of the head in profile, all joints short, but the third a little the longest, and bearing a very long dorsal arista. Thorax usually bare of pubescence, but with acrostichal bristles, which are biserial, six dorsocentral, a humeral, a posthumeral, two notopleural, a presutural, two or three supraalar, and a postalar bristle; scutellum with two marginal bristles, and on either side a small hair. Abdomen long and slender, with or without lateral bristles. Legs long and slender, with a few small bristles. Wings with the discal vein forked, the upper branch of which, as well as the posterior cross-vein, is either straight, waved, or angulated; anal vein weak, and not reaching the wing-margin.

The Australian species placed in this genus are not quite homogeneous, and will probably require further subdivision; until, however, further material from different parts of Australia is available for comparison, it seems best to leave all the species as they were originally described.

Table of the Tasmanian Species of Sciapus.

- | | |
|---|-------------------------|
| 1. Posterior cross-vein angulated in the middle. | 2 |
| Posterior cross-vein straight or almost so. | 4 |
| 2. Wings with three brown bands, that nearest the base short, the others long. | TRIFASCIATUS, Macq. |
| Wings hyaline; legs black. | GRANDIS, Macq. |
| Wings hyaline, except that the posterior cross-vein and the upper branch of the discal vein are suffused with brown; legs yellow. | 3 |
| 3. Antennæ orange; scutellum violet; angulation of the posterior cross-vein marked outwardly by a distinct veinlet. | BREVICORNIS, Macq. |
| Antennæ black; scutellum green; angulation of the posterior cross-vein without any outward veinlet. | CHALCEUS, Sp. nov. |
| 4. Wings with two brown bands. | DISCRETIFASCIATA, Macq. |
| Wings hyaline; legs yellow, with femora green in the male. | DISPAR, Macq. |
| Wings hyaline; legs black; abdomen densely hairy in the male. | NIGROPILOSUS, Macq. |

SCIAPUS TRIFASCIATUS, Macq.

Thorax metallic green; scutellum metallic blue; abdomen metallic green, banded with black; legs yellow; wings with three brown bands, that nearest the base very short, the others long.

Length. Male, 5.5-6 mm.; female, 5.5 mm.

Hab. Generally distributed.

Male. Face usually silvery-grey, but the upper part occasionally metallic green. Front metallic green or grey. Antennæ dark red, with apex of third joint black. Thorax metallic green; scutellum metallic blue. Abdomen metallic green, with anterior half or third of each segment black, and bearing very long, stiff, and shorter hair-like, black lateral bristles. Legs with femora and tibiæ dull yellow, tarsi, and also sometimes apex of tibiæ, black; the tibiæ bear a few short black bristles. Wings with the posterior cross-vein angulated in the middle, the angulation being marked outwardly by a small veinlet, and bearing

three cross-bands, the basal one very broadly interrupted in the centre, with the upper part sometimes indistinct, the others entire, but not reaching the hind-margin.

Female resembles the male very closely, and differs chiefly in the broader and more pointed abdomen.

S. trifasciatus is the commonest species of the genus, and seems to occur abundantly everywhere in the bush, during the months of December and January.

SCIAPUS GRANDIS, Macq.

This species is described by Macquart as golden-green, with the scutellum blue; antennæ black; femora black; tibiæ red; wings hyaline; the posterior cross-vein sinuated.

Length. Male, 8 mm.

Hab. "Tasmania."

S. grandis is unknown to me; it should be readily recognised by the black femora in conjunction with the hyaline wings and large size.

SCIAPUS BREVICORNIS, Macq.

Thorax brown, with metallic green and violet reflections; scutellum violet; abdomen metallic green, with violet reflections; legs entirely light yellow; wings with the upper branch of the discal vein and the posterior cross-vein suffused with brown.

Length. Male, 8 mm.

Hab. Mangalore.

Male. Face and front grey or black. Antennæ orange. Thorax light brown, with green and violet reflections; scutellum violet. Abdomen metallic green, with violet reflections, the anterior margins of third and fourth segments light yellow-brown; all segments with long black lateral bristles; and second and third segments with also black posterior dorsal bristles. Legs light yellow, the tarsi apically darkened; tibiæ with a few black bristles. Wings with the upper branch of the discal vein and the posterior cross-vein suffused with dark brown; posterior cross-vein angulated in the middle, the angulation being marked outwardly by a conspicuous veinlet; halteres yellow.

This species occurs amongst tussocks of long grass; it appears to be local, but is probably common where it occurs. My dates range from December 2 to December 24.

SCIAPUS CHALCEUS, Sp. nov. (Fig. 49.)

Thorax metallic green, with bronze reflections; scutellum metallic green; abdomen metallic green or bronze; legs yellow; upper branch of the discal vein and the posterior cross-vein suffused with light brown, the posterior cross-vein angulated in the middle, but the angulation not marked by any veinlet.

Length. Female, 6 mm.

Hab. Mangalore.

Female. Face and front grey. Proboscis large and fleshy, in length about one-third of the height of head. Antennæ black. Thorax metallic green, with bronze reflections, but the whole rather dull in appearance, and not with the vivid colouring of *S. trifasciatus*; acrostichal bristles short but distinct, the dorsocentral and lateral bristles long; scutellum dull metallic green, with two long black marginal bristles. Abdomen dull metallic green or bronze; the first segment and posterior halves of the second to fourth segments with a whitish tomentose appearance. Legs light yellow, with the tarsi apically darkened; tibiæ with a few small black bristles. Wings with the upper branch of the discal vein and the posterior cross-vein suffused with light brown; the posterior cross-vein angulated in the middle, but the angulation not marked by any veinlet.

This species, which is the same size as the common *S. trifasciatus*, may be distinguished from that species by the absence of any cross-bands on the wings; from *S. brevicornis* it is distinguished by the angulation of the posterior cross-vein being unmarked by an outer veinlet, by the smaller size, darker antennæ, and duller colouration.

S. chalceus frequents tree-trunks in the bush, in which localities it may be not uncommon. My dates range from January 18 to March 21.

SCIAPUS DISCRETIFASCIATUS, Macq.

This species is described by Macquart as green; abdomen with incisions black; posterior tibiæ in the male with a black ring; wings with two separated brown bands.

Length. Male and female, 4 mm.

Hab. "Tasmania."

According to Macquart's figure this species resembles *S. trifasciatus*, but the wing-tip is clear, and the posterior cross-vein is straight. It is unknown to me.

SCIAPUS DISPAR, Macq.

This species is described by Macquart as green; legs yellow, femora green in the male; wings hyaline.

Length, 4.5 mm.

Hab. "Tasmania."

In Macquart's figure the posterior cross-vein is given as straight. The species is unknown to me.

SCIAPUS NIGROPILOSUS, Macq.

Thorax (♂) blue-green, (♀) bronze-green; abdomen (♂) blue-green or bronze-green, (♀) bright cupreous; legs black; thorax and abdomen in the male bearing dense black pubescence.

Length. Male, 4.5 - 5 mm.; female, 4.5 mm.

Hab. Generally distributed.

Male. Face and front metallic blue-green or bronze-green. Eyes widely separated. Antennæ black. Back of head with a fringe of long white hairs. Thorax and scutellum blue-green; abdomen blue-green or bronze-green; both thorax and abdomen bearing long, stiff, black pubescence. Legs entirely black, the femora with extremely long black hairs. Wings tinged with grey, the subcostal vein long; radial and cubital veins of nearly equal length, and almost parallel; posterior cross-vein straight.

Female differs considerably in appearance from the male; thorax bronze-green instead of blue-green; abdomen shorter, more conical, and brightly cupreous; and the thorax, abdomen, and legs devoid of the long pubescence of the male. In the wings the subcostal vein is shorter, and the radial and cubital veins apically curved.

S. nigropilosus differs considerably from the other species of *Sciapus*, and will probably have to be placed in a distinct genus. It is a fairly common species, and may be found settled on the leaves of shrubs, or more rarely on the ground in sunny places. My dates range from October 1 to October 27.

Besides the foregoing species, a species was described by Macquart under the name of *Psilopus sidneyensis* from "Sidney Island and Tasmania." The former island, as has been pointed out by Miss Ricardo (Ann. Mag. Nat. Hist., May, 1914), belongs to the Phoenix Group, in Polynesia. These islands are situated close to the equator, and it seems unlikely that a delicate insect like the present should be common to two such widely differing localities. Under these circumstances, I think that some mistake has

probably arisen as to its place of origin. The species is described as green; scutellum violet; wings hyaline. Length, male, 8 mm. In Macquart's figure the posterior cross-vein is given as gently waved.

61. *ARACHNOMYIA*, Gen. nov. (Fig. 50).

Acrostichal bristles biserial; antennæ situated very high, with the arista dorsal; palpi large and conspicuous; eyes in the male joined at a short distance below the antennæ; abdomen long and slender; hypopygium large, but not recurved beneath the venter; legs very long, extremely slender, and practically bare; wings with the discal vein simple, but with a slight upward curve before reaching the margin.

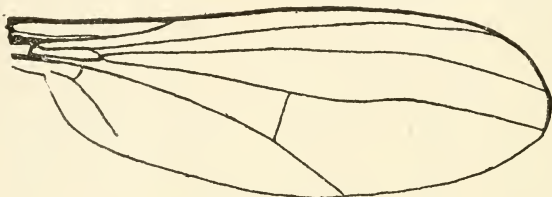


Fig. 50. Wing of *Arachnomyia arborum*.

Head a little broader than the thorax; the lower part of occiput bearing dense hairs. Proboscis thick and fleshy. Palpi large and conspicuous, rounded, with a short terminal bristle. Eyes in male joined for a very short distance at a point one-third the length of the face below the antennæ. Antennæ situated very high, the length, without the arista, about half that of the head, the first and second joints short and broad, the third narrowed apically, with the arista springing almost from its base. Thorax with two median rows of acrostichal bristles, and, on each side, one row of longer dorsocentral and humeral, posthumeral, notopleural, supraalar, and postalar bristles; scutellum with two long marginal bristles. Abdomen long, slender, and bare; hypopygium large, but not recurved beneath the venter. Legs very long and spidery, the middle pair the longest, the tarsi longer than the tibiæ, the whole bare both of pubescence and of bristles, except for one bristle situated about the middle of the posterior tibiæ. Wings with the normal venation of the family, the discal vein with a short upward curve before reaching the wing-margin.

This genus is easily distinguished from all the other Tasmanian genera of *Dolichopodidae* by the very long spidery legs. Only one species is at present known.

ARACHNOMYIA ARBORUM, Sp. nov. (Fig. 50).

Thorax bronze, with a bright green median stripe; abdomen dark bronze; legs entirely yellow; wings hyaline.

Length. Male, 6 mm.

Hab. Bagdad Valley.

Male. Face snow-white; proboscis dark brown; palpi light orange; there is a fringe of short white postocular bristles, and the lower part of occiput bears dense white hairs; vertex with long black bristles. Thorax bronze, with a median stripe of bright green, which does not reach as far as the scutellum; thoracic bristles black; scutellum bronze, with two very long, black, nearly-upright, marginal bristles. Abdomen bare, dark bronze, with ruddy reflections; genitalia very large, nearly globular, and raised far above the dorsum. Legs remarkably long and slender, light yellow, quite bare of pubescence or bristles, except for one black bristle about the middle of the posterior tibiæ; the middle legs the longest, the tarsi longer than the tibiæ; the anterior tarsi have the first joint the longest, the middle tarsi the second joint the longest; in the posterior tarsi I am unable to make out any articulation between what should normally represent the first and second joints, consequently the basal joint is of immense length. Wings hyaline.

This species frequents tree-trunks in the bush. The long legs seem an adaptation to its mode of life, and is a similar development to that found in certain species of the families *Dexidae* and *Micropezidae* which have similar habits. It occurs during January, but seems to be generally scarce.

62. DIAPHORUS, Meig.

Eyes of the male touching on the front; antennæ with arista dorsal; wings broad, with the cubital and discal veins almost parallel.

Head as broad as, or a little broader than, the thorax; the vertex not excavated. Eyes joined above the antennæ in the male, separated in the female. Antennæ with the three joints all short, the third rounded, and bearing a long dorsal arista, which is microscopically haired. Thorax metallic, but of rather dull appearance; acrostichal bristles biserial, and there are also five dorsocentral, one humeral, one posthumeral, two notopleural, three supraalar, and one postalar bristle. Abdomen short, with hindmarginal bristles; apex in male with four blunt

bristles; hypopygium small, and almost concealed beneath the apex. Legs of medium length, usually with only a few small bristles, but sometimes distinctly bristly; anterior tarsi in the male with the pulvilli enlarged. Wings rather broad, the cubital and discal veins almost parallel, though both may be gently curved down towards the margin.

The species belonging to this genus are small, dull metallic flies, which may often be seen resting on tree-trunks. They can be recognised without difficulty by the eyes of the male being joined above the antennæ. In Tasmania two species are known to occur.

Table of the Tasmanian Species of Diaphorus.

1. Abdomen with the second segment whitish, remainder dark brown; legs in male very bristly, the bristles on inner side of posterior tibiæ extremely long. SETOSUS, Sp. nov.
2. Abdomen entirely dark brown; legs with only a few short scattered bristles. COMMUNIS, Sp. nov.

DIAPHORUS SETOSUS, Sp. nov.

Thorax dull metallic green; abdomen dark brown, with the second segment whitish; femora black; tibiæ light brown; legs in the male very bristly; the bristles on the inner side of the posterior tibiæ extremely long.

Length. Male, 4-4.5 mm.

Hab. Hobart.

Male. Eyes red, large, joined on the front, and only slightly separated on the face, which is consequently very narrow. Antennæ black. Thorax dull metallic bluish-green; thoracic bristles very long; scutellum similarly coloured to the thorax, with two very long and two short marginal bristles. Abdomen dark brown, with the second segment whitish, the whole shining, but not metallic, and bearing black, lateral, hindmarginal bristles and shorter black hairs; apex with four black bristles. Legs with femora black; tibiæ and first joint of tarsi light brown, remaining tarsal joints black; all femora with numerous black bristles, which are longest on the posterior pair; anterior and middle tibiæ with a few black bristles, the middle tibiæ with long spurs; posterior tibiæ with long, stiff, black bristles outwardly, and very long, thin bristles inwardly; first joint of posterior tarsi with short bristles; all joints, in addition to the bristles mentioned, bear a fine black ciliation. Wings hyaline, the cubital and discal veins almost equidistant throughout, and curved down

slightly at their ends towards the wing-tip; anal vein short and sinuated; halteres whitish-yellow.

This species frequents logs in the bush during the month of November; it seems to be somewhat uncommon.

DIAPHORUS COMMUNIS, Sp. nov.

Thorax dull green, frequently a little brownish; abdomen dark brown, unicolorous; legs entirely black (♂) or with tibiæ dull brown (♀), with only a few short bristles; posterior tibiæ without any long bristles on the inner side.

Length. Male, 4 mm.; female, 3.5 mm.

Hab. Mangalore. (Probably generally distributed.)

Male. Eyes joined on two-thirds of the front, leaving a small frontal triangle between the eyes and the antennæ; face rather narrow. Antennæ black. Thorax dull green, frequently rather brownish, and sometimes with two green median stripes; thoracic bristles rather long; scutellum similarly coloured to the thorax, with two long and two very short black marginal bristles. Abdomen shining dark brown, with fairly dense black lateral pubescence, and four black apical bristles. Legs black; femora fringed with black pubescence; anterior and middle tibiæ almost without bristles; posterior tibiæ with a few scattered black bristles. Wings with the cubital and discal veins almost equidistant throughout, and curved down gently at their ends towards the wing-tip; anal vein long and nearly reaching the margin; halteres yellow.

Female resembles the male very closely, but the eyes are well separated, the abdomen shorter and broader, and the legs generally lighter.

This species may be distinguished from *D. setosus* by the unicolorous abdomen, and, in the male, by the much less bristly and darker legs. It may be met with commonly settled on tree-trunks and on stones, and is probably generally distributed. My dates range from November 2 to January 26.

63. LIPAROMYIA. Gen. nov. (Fig. 51).

Arista situated right at the base of the third antennal joint, which in the male is very long, narrow, and pointed, in the female short and rounded; the first joint of arista short; thorax with acrostichal bristles uniserial; wings with the radial, cubital, and discal veins parallel and equidistant.

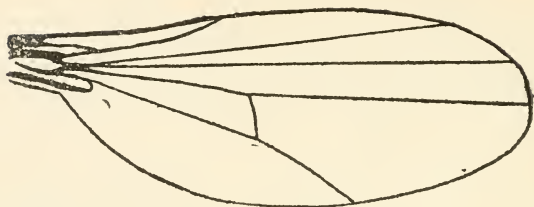


Fig. 51. Wing of *Liparomyia sedata*.

Eyes well separated on the front in both sexes, but, in the male, only narrowly divided on the face. Antennæ, without the arista, a little shorter than the head, the first and second joints very short, the third, in the male, as long as the first two together, humped at the base, then slender and pointed, and bearing a long arista which springs from its base; the arista is two-jointed, the first joint being short, and less than half the length of the third antennal joint; in the female the third joint is short and rounded. Thorax with one row of acrostichal bristles, which are very short, two rows of dorsocentral bristles, and humeral, posthumeral, notopleural, supraalar, and postalar bristles; scutellum with two very long, widely separated, marginal bristles. Abdomen longer and narrower in the male than in the female, nearly bare in both sexes, but bearing a few small bristles; in the male the hypopygium is curved forward beneath the venter, but only for a short distance. Legs simple in both sexes; posterior femora with short bristles. Wings short and rather broad, the radial, cubital, and discal veins straight and almost equidistant; anal vein apparently wanting.

This genus, in the form of the antennæ, resembles *Anepsiomyia*, *Bezzi*, but is distinguished from that genus by the very much shorter first joint of the arista. Only one species is at present known.

LIPAROMYIA SEDATA, Sp. nov. (Fig. 51).

Thorax brown; scutellum dull metallic blue-green; abdomen brown; legs yellow-brown, with the femora dark brown above; wings hyaline.

Length. Male and female, 2 mm.

Hab. Mangalore.

Male. Antennæ brownish-black, of the form described under the generic characters. Thorax dark brown, unstriped; thoracic bristles black; scutellum dull metallic

blue-green, with two very long, widely-separated, marginal black bristles. Abdomen brown, with small hindmarginal black bristles; hypopygium similarly coloured and fringed with black pubescence. Legs with femora dark brown above, yellow-brown below; tibiæ and tarsi yellow-brown, the tarsi apically darkened; anterior and middle femora almost bare, posterior femora with a row of rather long, weak, black bristles; posterior tibiæ with shorter, but stiffer, black bristles; anterior tibiæ bare; middle tibiæ with a few black bristles. Wings hyaline, with dark veins.

Female resembles the male very closely, but the third antennal joint is short and rounded, and the legs are lighter.

Of this species I have come across two specimens, a male taken on October 26, 1912, and a female, settled by the side of a pond, on April 26, 1914; from its small size it is apt to be overlooked, and the species may not be uncommon.

64. HYDROPHORUS, Fall.

Wings having the last part of the postical vein not longer than the posterior cross-vein; antennæ with the third joint rounded, and the arista dorsal.

Head as broad as, or a little broader than, the thorax; vertex more or less excavated. Eyes well separated in both sexes. Antennæ situated rather high, all joints short, but the third a little the longest, rounded apically, and bearing a long, two-jointed arista. Thorax with one row of small acrostichal bristles, two rows of dorsocentral bristles, and, on each side, a humeral, a posthumeral, two notopleural, and a postalar bristle, scutellum with four marginal bristles. Abdomen short, the hypopygium of the male almost concealed, and not recurved beneath the venter. Legs of medium length, and frequently showing sexual characters; femora and tibiæ with bristles. Wings rather long and narrow, sometimes spotted, the last part of the postical vein (i.e., the part from the discal cell to the wing-margin) very short, and not longer than the posterior cross-vein, so that the discal cell is very long, and approaches close to the wing-margin.

The species belonging to this genus are confined to the neighbourhood of water, on the surface of which most of them are able to run. A Tasmanian species, which is unknown to me, was described by Macquart.

HYDROPHORUS CUPREUS, Macq.

Copper-coloured, with green reflections; abdomen with segmentations white; legs yellow; wings clear, with a yellowish tinge.

Length. Female, 4 mm.

Hab. "Tasmania."

In Macquart's figure of the wing the discal vein is given as converging apically towards the cubital vein. The species is unknown to me.

Family XI. PHORIDÆ.

Very small flies, with a peculiar venation, the wings having two strong anterior veins, reaching only half-way to the tip, and three or four faint veins running diagonally across the wing.

Head rather small, about the same breadth as the thorax, the vertex usually bristly. Eyes separated in both sexes. Antennæ short, the third joint concealing the other two, and bearing an apical or dorsal arista. Thorax large, and greatly arched, with, usually, posterior bristles. Abdomen rather short, the genitalia of the male often large, of the female small and projecting. Legs rather stout, femora large; tibiæ frequently with a few bristles, and spurred; posterior tarsi lengthened. Wings usually large and broad, but sometimes wanting; three longitudinal veins present, the first very weak, and partly coalesced with the second; the second strong and always simple; the third very strong, either simple or forked, or with the apex thickened, and extending to about the middle of the costa; three or four light veins also present, extending diagonally from the third vein to the hinder margin; costa with the basal half usually bristly.

This family seems to be very poorly represented in Australia, only five species having so far been described. One of these is a curious, wingless form, discovered by Lea in an ants' nest in Victoria, and described by him under the name of *Euterimorpha abdominalis*. In Tasmania only one species is at present known to occur.

65. APHIOCHÆTA (Fig. 52).

Anterior frontal setæ proclinate; middle tibiæ devoid of any setæ near the base; wings with the basal part of costa bristly, and the third longitudinal vein forked.

Head situated low down in front of the greatly arched thorax, and about equal to it in breadth. Antennæ with the third joint rounded, and bearing a dorsal arista. Palpi prominent and bristly. Front with numerous strong setæ, the anterior ones much shorter than the others and proclinate. Thorax much arched, dorsally bare, but with a few strong posterior bristles. Abdomen short, rather robust, and altogether without bristles. Legs simple, tibiæ spurred, but without bristles. Wings with the basal part of costa bristly, and the third longitudinal vein forked.

APHIOCHÆTA NEBULOSA, Walk. (Fig. 52).

Syn. *Phora nebulosa*, Walk.

Thorax and abdomen brownish-black; legs yellow; wings hyaline.

Length. Male and female, 2.5-3 mm.

Hab. Mangalore. (Probably generally distributed.)

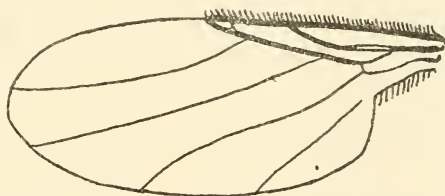


Fig. 52. Wing of *Aphiochæta nebulosa*.

Male and female. Front and antennæ brownish-black. Palpi yellow, with black bristles. Thorax brownish-black, almost bare, but with long posterior black bristles. Abdomen brownish-black, bare. Legs yellow or brownish-yellow, the posterior tibiæ and tarsi frequently darkened; femora somewhat swollen; tibiæ spurred, but without bristles. Wings hyaline, with veins light brown; the second longitudinal reaches the costa about half-way between the base of wing and apex of third longitudinal vein; third longitudinal forked; halteres yellow.

This species occurs commonly on windows at Mangalore, and is probably generally distributed. My dates range from April 7 to May 13.

Addenda et Corrigenda. Part I.

LEPTIDÆ.

METOPONIA, Macq. This genus should probably be placed in the *Stratiomyidæ*, subfamily *Berina*; no specimen has yet come to hand, so its position is still open to doubt, but there is reason to believe that the *Xylophagina*, in which Macquart placed it, do not occur in the Australian region.

STRATIOMYIDÆ.

LECOGASTER. Prof. Bezzi has been good enough to point out to me that this name is preoccupied. I, therefore, propose in its place the name *Lecomylia*.

ODONTOMIA MARGINELLA, Macq. The specimen referred to as being in the collection of the Department of Agriculture, Hobart, proves to be merely a small variety of *O. amyris*, Walk.; no recent specimen of *O. marginella* is, therefore, known. The distinguishing character of the species is found in the black femora.

ODONTOMYIA CARINATA, Macq. This species should be sunk as synonymous with *O. amyris*.

ODONTOMYIA SUBDENTATA, Macq. (Syn. *O. annulipes*, Macq.) A female, apparently belonging to this species, was taken by Mr. Hardy at Geeveston on December 25, 1914. It resembles *O. amyris*, but differs from that species in having the fulvous lower third of front divided from the fulvous face by a black band, which slopes down on either side towards the eyes. The male of *O. subdentata* has the face entirely black. This species should, therefore, be added to the Tasmanian list.

NEMESTRINIDÆ.

TRICHOPSIDEA ÆSTRACEA, Westw. In the British Museum Collection are four specimens of this species, three of which are from Tasmania, the fourth being from Queensland. The species may be recognised by the extremely faint wing-veins, only the two diagonal veins being distinct.

Systematic List of the Species described in this Paper.

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NOTES ON TASMANIAN DIPTERA AND DESCRIPTIONS OF NEW SPECIES, ETC.

By G. H. HARDY.

(Read 12th June, 1916. Issued separately 23rd Dec., 1916.)

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ONCODES FLAVESCENS, White.

O. flavescens, White. P. and P. Roy. Soc. Tas., 1914,
pg. 70.

O. nigrinervis, White. id. pg. 71.

O. ater, White. id. pg. 72.

The three specimens of *Oncodes*, described by Mr. White, are undoubtedly variations of the same species. I have a long series of *Oncodes* showing several variations and sizes graduating between the three descriptions, and from observations made at Launceston, where they were abundant, I have no hesitation in stating that *flavescens* is the male, and the other two are females.

Mr. White informs me that specimens of *nigrinervis* have been taken in Victoria and New South Wales, whilst *ater* is only known from Tasmania. I revised my series giving this consideration, but can find no real distinction on examining my series as a whole. The following table gives the localities of *Oncodes* in my collection, and the number of specimens taken:—

	N.W. Coast.	Launceston.	East Coast.	Others.	Total.
Flavescens... ..	2 ...	6 ...	11 ...	1	20
Nigrinervis	3 ...	12 ...	23 ...	1	39
Ater... ..	6 ...	— ...	3 ...	—	9
Pygmæus	2 ...	— ...	— ...	—	2
Totals	13 ...	18 ...	37 ...	2	70

The two N.W. Coast (Wynyard) *flavescens* could well be the male of *var. ater* (the apical yellow margins are partly obsolete), to which form, the three *nigrinervis* from the same district closely approximate.

All the Launceston specimens are typical, both male and female, but the East Coast specimens (Triabunna and Maria Island) show marked variation, so much so, that I have difficulty in isolating the true *ater* from *nigrinervis*.

I leave the identification of *O. pygmaeus* until further specimens are to hand, but I suspect the species will ultimately fall to a variety of *O. flarescens*. The abdomen of *pygmaeus* seems to be identical with the colour of the abdomen in dead specimens found clinging to twigs, and indeed some live specimens show signs of the abdomen becoming similarly discoloured.

A pair from Launceston (in cop.?), not included in the above table, has the female with the abdomen damaged, and this has a decided "red-brown" colour.

The following descriptions cover my series of *O. flarescens*, both male and female.

Male. Black; the abdomen often extensively marked (especially in large specimens) with yellow and yellow-brown; legs yellow-brown, and often stained with black. Wings hyaline, veins varying from yellowish to very faintly marked.

Female. Black; the apex of the abdominal segments generally conspicuously bordered narrowly white; legs varying as in male. Wings sometimes suffused with brown or smoky (hyaline in small specimens), the veins in large specimens often strongly marked.

Female, var. ater (White). Under this name I propose to include specimens with black abdomens, and without trace of apical white margins.

The chief sexual character is to be found in the shape of the abdomen, where, in the male, the abdomen is distinctly longer than wide. In the female the abdomen is scarcely longer than wide, and viewed from above, the outline forms almost a circle. If the apical borders of the abdominal segments are present, they are light yellow in the male, and white in the female.

Length. Male, 8 mm. to 5 mm.; female, 7 mm. to 4 mm.

Hab. Hobart, 1 ♀ (type); Triabunna, 5 ♂, 18 ♀; Maria Island, 5 ♂, 9 ♀; Wynyard, 2 ♂, 9 ♀; Mole Creek, 1 ♀; Launceston, 7 ♂, 13 ♀; Bagdad, 1 ♂.

My dates range from November 10 to February 6, and without doubt this period will be considerably extended.*

Specimens can be taken at all hours of the day, occasionally in quantities, sitting on the underside of dead twigs of trees where their inflated bodies form conspicuous objects against the sky.

*Since the above was written, I took a male specimen in Hobart dated 1st October, 1916.

TABANIDÆ.

TABANUS WYNYARDENSIS, sp. nov.

Male. Hairy, black and brown; easily identified by the broad black stripe down the brown abdomen, and the absence of recurrent vein. Eyes densely hairy.

Face greyish, with black hairs, beard yellow. Palpi brown with long yellow, brown and black hairs; rounded apically. Antennæ brown, second joint light, the third joint apically very dark. Thorax olive, with three black stripes, scutellum black, the whole covered with upright black and brown hair.

Abdomen brown, with a broad median black stripe covering more than half the area, with black and brown hair, which is upright on the basal segments and more or less depressed apically; the apical margins of the segments fringed with yellow hair. Underside of abdomen uniform lighter brown, covered with shorter light hair. Legs brown. Wings hyaline, stigma brown, appendix absent.

Length, 13 mm.

Hab. Wynyard, 3rd February, 1916. 2 males.

A specimen in the collection of the Agricultural Department is labelled "Swansea, Tas., Lea."

The eyes of *Tabanus similis*, Macq., according to Miss Ricardo, are bare, therefore it is unlikely this species is the male of *T. similis*, which according to Mr. White's key it would naturally run to.

PELECORHYNCHUS ERISTALOIDES, Walk.

I took a second male specimen of this species at Geeves-ton on the 19th January, 1916.

P. eristaloides, subsp. *montanus*., subsp. nov.

Differs from the typical *eristaloides* by having more slender shape, smaller white spots on the thorax (about half the size), narrower black stripes on the thorax (about two-thirds the width), the entire absence of red hair, and the spots on the wings being almost entirely obsolete.

Type (male) taken in cop. with a female on the 6th January, 1916. Another pair in cop., and a further two males and two females were taken on the 10th January, 1916. Another specimen, in the the collection of the Agricultural Department, was taken by Mr. A. M. Lea.

Length. Male 15 mm., female 18 mm.

Hab. Summit of Mt. Wellington, where it is fairly abundant on the low flowering shrubs, but almost impos-

sible to catch when active on the wing. The specimens secured were taken between 10 and 11 a.m., when beginning to fly.

PELECORHYNCHUS FUSCONIGER, Walk.

Two specimens in the Museum collection, in bad condition, and a further two specimens in the Agricultural Department's collection bear a label "Ulverstone, Tas.; Lea."

THEREVIDÆ.

ANABARRHYNCHUS, Macq.

Under this genus, Mr. White described eight species from Tasmania, adding the name of another as doubtfully Tasmanian.

There are three coastal species occurring on sand-dunes, namely, *pallidus*, the doubtful Tasmanian species *rufipes*, and a new species described below.

The three can be readily distinguished from all other species, except perhaps *montanus*, by the wings, which are tinged yellow or brown along the veins. This characteristic is sometimes faint in *pallidus*. My specimens of *montanus* (from Mt. Wellington) are all slightly tinged dark along veins except one, but *montanus* will not be confused in any way with the coastal species.

ANABARRHYNCHUS RUFIPES, Macq.

Readily distinguished by the yellow-brown femora and tibiæ, the grey thorax with three brown stripes, and the wings tinged yellow along the veins.

Male. Head grey, front darker centrally, with black hair, proboscis prominent. Antennæ, first joint shorter than the other two joints combined (in *pallidus* the first joint is longer), the first two joints brownish, the third joint black, basally brownish. Thorax grey, with three parallel brown stripes, darkest down the centre; the central stripe is black down the centre, and is continued on the scutellum. Abdomen black-brown, with the apical and side margins of segments grey, except the three apical segments which are generally more or less uniformly light yellowish-brown tinged. Legs yellowish-brown, coxæ and trochanters grey, the femora and tibiæ apically stained black, the tarsi with the apical half of first, and whole of the following segments black. Wings similar to *pallidus*, but veins black.

Female differs from the male in having the front brown.

Length. Male 9 mm., fem. 10.5 mm.

Hab. Sand-dunes on the Coast. Maria Island, 1 male and 1 female. 1st January, 1916. Also collected by Mr. Clive Cole at Bellerive during January and February.

It is readily distinguished from *pallidus*, with which it occurs, by the three distinct stripes on the thorax, the face not being produced so prominently, the absence of two spots on the front, the different proportions of the antennæ, the knees of the legs being black, and its larger size.

ANABARRHYNCEUS MARITIMUS, sp. nov.

In Mr. White's key this would run to *latifrons*, but is easily distinguished by its two conspicuous brown stripes on the thorax and the wings tinged along veins.

Male. Black, face white, the front shining black with black pubescence. Antennæ with the first joint as long as the third (in *latifrons* it is shorter). Thorax shining with two distinct light brown stripes, not reaching the apex, and a pair of whitish shoulder stripes. Abdomen with only three of the segments bordered white apically. Legs as in *latifrons*. Veins of wings bordered with a dark tinge.

Female similar to the male.

Hab. Sand-dunes on Coast. Maria Island, 1st January, 1916, one pair in cop., and one female. St. Helens, six specimens collected on the same date by Mr. F. M. Littler.

ASILIDÆ.

BRACHYRHOPALA NITIDUS, Macq.

Apparently the male only is described under this name. I have females from Wynyard and Eaglehawk Neck that agree with the description of the male, and also a female from Mr. Wellington so very distinctive that it might be an entirely new species, but I am unable to find a reliable distinction other than size and colour. The males are not uncommon on Mt. Wellington, I have not seen a female other than this unique specimen from the locality. I propose to call the variety:—

B. nitidus, var. *dissimilis*, var. nov.

Female. A large yellow species with hyaline wings and black veins. Its yellow colour will at once distinguish it from the typical *nitidus*, and also its clear wings give it a very distinctive appearance.

Dull yellow. Face dull reddish, and not bright yellow as in typical *nitidus*, antennæ red. Thorax, as in typical *nitidus*, has black markings, but differs in having no yellow

or whitish markings mixed with the black. Abdomen with black markings on basal segments as in typical *nitidus*. Legs uniform yellow; the black claws, and yellow spurs on the anterior tibiæ, much smaller in proportion to the typical *nitidus*.

A comparison of dimensions between the female typical species and the variety is of interest.

	Fem. typical <i>nitidus</i> .	Fem. var. <i>dissimilis</i> .
Length	18-22 mm.	22 mm.
Maximum width across thorax .	3 mm.	4 mm.
Maximum width across abdo- men	2-2.5 mm.	4 mm.
Hab.	Mt. Wellington, 2,000ft. 10th January, 1916.	

ABSTRACT OF PROCEEDINGS

1916.

20TH MARCH, 1916.

Annual Meeting.

The Annual General Meeting was held at the Museum at 8 p.m. Dr. A. H. Clarke occupied the chair.

The Secretary (Dr. J. L. Glasson) read the Annual Report, and the Treasurer (Mr. L. Rodway) presented the Balance-sheet. These were adopted, on the motion of the Chairman, seconded by Mr. J. A. Johnson.

The following having been nominated as members of the Council for 1916, were declared elected:—Dr. A. H. Clarke, Professor T. T. Flynn, Messrs. L. Dechaineux, L. F. Giblin, H. Heaton, J. A. Johnson, L. H. Lindon, L. Rodway, and Dr. J. L. Glasson.

The election of an auditor was left to the Council.

Mr. L. Rodway moved that a special meeting be held to consider an alteration of the rules, to enable non-members of the Council to be eligible for appointment as vice-presidents. Carried.

Mr. C. W. Hemery gave a lecture on "Places I have seen and people I have met."

10TH APRIL, 1916.

Special General Meeting.

A Special General Meeting of the Society was held at 8 p.m., at the Museum. Dr. Clarke occupied the chair.

Mr. Rodway moved that in Rule 3 the word "Council" be struck out, and "Society" substituted therefor. Mr. J. A. Johnson seconded. Carried.

Mr. Heaton moved that a new section F be formed in Australasian History, Geography, and Economics. Mr. R. M. Johnston seconded. Carried.

Ordinary Monthly Meeting.

At the close of the General Meeting, the ordinary monthly meeting was held.

Mr. R. M. Johnston read a preliminary note by Mr. W. H. Twelvetreese, on an aboriginal flake discovered at the Doone alluvial mine.

Papers.

The following papers were read :—

1. "A determination of the height of Barn Bluff."
By H. R. Hutchison, L. F. Giblin, and W. F. D. Butler.
2. "Notes on the geology of the Cradle Mountain district." By W. N. Benson.

8TH MAY, 1916.

The Monthly General Meeting was held at the Museum at 8 p.m.

Paper.

"Additions to the Bryophyte Flora." By L. Rodway.

Discussion.

A discussion on Industry and Education was opened by Mr. H. Heaton and Mr. L. Dechaineux. Messrs. M. M. Ansell, R. M. Johnston, and J. A. Johnson also spoke.

Mr. J. A. Johnson moved that the Council be requested to consider what further steps should be taken to put into effect the views expressed at the meeting. Carried.

12TH JUNE, 1916.

The Monthly General Meeting was held at the Museum at 8 p.m. His Excellency the President occupied the chair.

The President announced that, in accordance with Rule 3, he had appointed Mr. R. M. Johnston and Major E. L. Piesse to be Vice-presidents of the Society.

Paper.

"Notes on Tasmanian Diptera, and descriptions of new species." By G. H. Hardy.

Lecture.

His Excellency Sir Wm. Ellison-Macartney, President of the Society, delivered a lecture on "Some Broken Reeds."

10TH JULY, 1916.

The Monthly General Meeting was held at the Museum at 8 p.m. His Excellency the President occupied the chair.

Paper.

"Discovery of an aboriginal chipped flake in deep ground near Gladstone." By W. H. Twelvvetrees.

Lecture.

Mr. L. Rodway delivered an illustrated lecture on "Botany at Cradle Mountain."

21ST AUGUST, 1916.

The Monthly General Meeting was held at the Museum at 8 p.m. His Excellency the President in the chair.

Papers.

1. "Contributions to the Flora of Tasmania." By R. A. Black.
2. "A New Tasmanian Butterfly." By G. H. Hardy.
3. "The Diptera-Brachycera of Tasmania. Part III." By A. White.

Lecture.

Dr. L. S. Miller delivered an illustrated lecture on "Egypt."

18TH SEPTEMBER, 1916.

The Monthly General Meeting of the Society was held at the Museum at 8 p.m. His Excellency the President in the chair.

Lecture.

Professor T. Thomson Flynn delivered an illustrated lecture on "The Great Barrier Reef. Part I. Coral and Coral Reefs."

30TH OCTOBER, 1916.

The Monthly General Meeting was held at the Museum at 8 p.m. His Excellency the President in the chair.

Lecture.

Professor T. Thomson Flynn delivered a lecture on "The Great Barrier Reef. Part II."

Mr. J. N. Raamsdonk, B.A., B.C.L., Lecturer in Modern Languages in the University of Tasmania, delivered an address commemorating the first landing of Dirk Hartog in Australia, October 25th, 1616.

Mr. L. Rodway spoke of the loss science had sustained through the death of G. W. Smith, and it was resolved that an obituary notice should appear in the Society's annual volume.

[The note written by Mr. Rodway and containing the substance of his remarks appears on page 286 of this volume.]

ANNUAL REPORT

The Royal Society of Tasmania

1916

Patron :

HIS MAJESTY THE KING.

President :

HIS EXCELLENCY SIR WILLIAM GREY ELLISON-MACARTNEY, P.C.,
K.C.M.G., GOVERNOR OF TASMANIA.

Vice-Presidents :

R. M. JOHNSTON, L.S.O.
MAJOR E. L. PIESSE.

Council :

Elected 20th March, 1916.

A. H. CLARKE, M.R.C.S., L.R.C.P. (Chairman)	J. L. GLASSON, M.A., D.Sc.
L. DECHANEUX.	HERBERT HEATON, M.A., M. Comm.
PROF. T. THOMSON FLYNN, B.Sc.	J. A. JOHNSON, M.A.
L. F. GIBLIN, B.A.	L. H. LINDON, M.A.
	LEONARD RODWAY.

Honorary Secretary :

J. L. GLASSON.

Honorary Treasurer :

LEONARD RODWAY.

Honorary Librarian :

L. DECHANEUX.

Editor :

J. L. GLASSON.

Honorary Auditor :

R. A. BLACK.

Honorary Members :

David, T. W. Edgeworth, C.M.G., B.A., F.R.S., F.G.S.
Professor of Geology and Physical Geography in the
University of Sydney. The University, Sydney.

Mawson, Sir Douglas, B.E., D.Sc. Adelaide.

Shackleton, Sir Ernest H., Kt., C.V.O., F.R.G.S., F.R.A.S.
9 Regent-street, London, S.W., England.

Spencer, W. Baldwin, C.M.G., M.A., F.R.S. Professor of
Biology in the University of Melbourne. The Uni-
versity, Melbourne.

Ordinary, Life, and Corresponding Members :

"C," Corresponding Member.

"L," Member who has compounded subscriptions for life.

"", Member who has contributed a Paper read before the Society.

Year of
Election.

- | | | |
|------|---|---|
| 1916 | | Ansell, M. M., B.A. The Registrar the Univer-
sity, Hobart. |
| 1908 | L | Baker, Henry D. C/o American Consulate,
Hobart. |
| 1887 | | Barclay, David. 143 Hampden Road, Hobart. |
| 1890 | | *Beattie, J. W. 1 Mount Stuart Road, Hobart. |
| 1901 | C | Benham, W. B., M.A., D.Sc., F.R.S., F.Z.S.
Professor of Biology, University of
Otago. Dunedin, New Zealand. |
| 1903 | | Bennett, W. H. "Ashby," Ross. |
| 1900 | | Bennison, Thomas. 29 Cromwell Street,
Hobart. |
| 1912 | | *Black, R. A. Chief Clerk, Department of
Agriculture. 50 High Street, Queen-
borough. |
| 1909 | | *Blackman, A. E. Franklin. |
| 1913 | | Bottrill, W. E., LL.D. 7 Elphinstone Road,
Hobart. |
| 1892 | C | Bragg, W. H., M.A., F.R.S. Professor of
Physics in University College, London. |
| 1900 | | *Brettingham-Moore, G. E. 294 Davey Street,
Hobart. |
| 1911 | | Brooks, G. V. Master of Method, Elizabeth
Street Practising School, Hobart. Main
Road, New Town. |
| 1907 | | Brownell, F. L. "Leura," Main Road, Moonah. |
| 1879 | | Burgess, The Hon. W. H. "Milliara," Mona
Street, Hobart. |
| 1909 | | Butler, W. F. D., B.A., M.Sc., LL.B. Bishop
Street, New Town. |

		Year of Election.	
		1912	Chapman, J. R. Holebrook Place, Hobart.
	C	1901	Chapman, R. W., M.A., B.C.E. Elder Professor of Mathematics and Mechanics in the University of Adelaide. The University, Adelaide.
		1913	Chepmell, C. H. D. Clerk of the Legislative Council. 23 Swan Street, Hobart.
		1896	*Clarke, A. H., M.R.C.S., L.R.C.P. Macquarie Street, Hobart.
		1887	Clemes, Samuel. Principal of Leslie House School. Clare Street, New Town.
		1910	Clemes, W. H., B.Sc. Leslie House School, Argyle Street, New Town.
		1884	Davies, The Hon. C. E., M.L.C. "Lyndhurst," New Town Road, New Town.
		1908	Dechaineux, Lucien. Principal of Technical School, Hobart.
		1903	Delany, Most Rev. Patrick. Archbishop of Hobart. 99 Barrack Street, Hobart.
	C	1892	Dendy, A., D.Sc., F.R.S., F.L.S. Professor of Zoology in the University of London (King's College). "Vale Lodge," Hampstead, London, N.W.
		1861	Dobson, The Hon. Henry. Elboden Street, Hobart.
		1916	Downie, W. A. Headmaster, Central School. Hobart.
		1911	Dunbabin, Thomas, M.A. 22 Lansdowne Crescent, Hobart.
		1916	Duncombe, E. W. Headmaster, Albuera Street School, Hobart.
		1909	Fereday, Mrs. R. W. Holebrook Place, Hobart.
		1902	Finlay, W. A. 11 Secheron Road, Hobart.
		1909	*Flynn, T. Thomson, B.Sc. Ralston Professor of Biology in the University of Tasmania. D'Arcy Street, Hobart.
	L	1890	Foster, H. D. 137 Hampden Road, Hobart.
	L	1905	Foster, J. D. "Fairfield," Epping.
		1913	Fowler, T. W., M.C.E. Engineer-in-Chief of Tasmania. Clare Street, New Town.
		1908	*Giblin, L. F., B.A., M.H.A. 326 Macquarie Street, Hobart, and "Cobbler's End," Cambridge.
		1913	*Glasson, J. L., M.A., D.Sc. Lecturer in Physics in the University of Tasmania. The University, Hobart.

Year of
Election.

- 1914 Goetze, A.E. Bellerive.
- 1907 Gould, Robert. Longford.
- 1905 L Grant, C. W. "High Peak," Huon Road.
- 1913 *Hardy, G. H. Hurlstone. Assistant-Curator of the Tasmanian Museum. The Museum, Argyle Street, Hobart.
- 1898 Harrison, M. W. Glenorchy.
- 1893 Harvey, W. A., M.B. 154 Macquarie Street, Hobart.
- 1902 C Haswell, William, M.A., D.Sc., F.R.S., F.L.S. Challis Professor of Biology in the University of Sydney. The University, Sydney.
- 1913 Hawson, Edward. "Remine," 174 Argyle Street, Hobart.
- 1915 *Heaton, Herbert, M.A., M. Comm. Lecturer in History and Economics in the University of Tasmania. The University, Hobart.
- 1915 Hickman, V. V., B.Sc. Lecturer in Chemistry, School of Mines, Zeehan.
- 1914 Hitchcock, W. E. Moina.
- 1908 Hogg, G. H., M.D., C.M. 37 Brisbane Street, Launceston.
- 1909 *Hutchison, H. R. 1 Barrack Street, Hobart.
- 1913 Ife, G. W. R., LL.B. Summerhill Road, Hobart.
- 1912 Inglis, C. J. Holebrook Place, Hobart.
- 1898 *Ireland, E. W. J., M.B., C.M. 160 Elizabeth Street, Hobart.
- 1906 *Johnson, J. A., M.A. Principal of the Philip Smith Training College. Hobart. "Wharepuke," Argyle Street, New Town.
- 1873 *Johnston, R.M., I.S.O., F.S.S. Government Statistician. Tasmanian Club, Macquarie Street, Hobart.
- 1910 Kermode, R. C. "Mona Vale," Ross.
- 1905 Kerr, George. 165 Campbell Street, Hobart.
- 1913 Knight, J. C. E. "Windermere," Claremont.
- 1873 *Legge, Col. W. V., R.A. (R.). "Cullenswood House," Cullenswood.
- 1887 Lewis, Sir Neil Elliott. K.C.M.G., M.A., B.C.L., LL.B., M.H.A. "Werndee," Augusta Road, New Town.

Year of
Election.

- 1912 Lindon, L. H., M.A. Warden of Christ's College, Hobart. "The Lodge," Park Street, Hobart.
- 1900 Lines, D. H. E., M.B., Ch.B. Archer Street, New Town.
- 1875 C Liversidge, Professor Archibald, M.A., LL.D., A.R.S.M., F.R.S., F.I.C., F.C.S., F.G.S., F.R.G.S. "Fieldhead," Coombe Warren, Kingston, Surrey, England.
- 1912 McAlister, Miss M. K. Rosetta.
- 1893 *McAulay, Alexander, M.A. Professor of Mathematics in the University of Tasmania. The University, Hobart.
- 1908 McElroy, J.A., Principal of Franklin House School. 179 Davey Street, Hobart.
- 1902 C *Maiden, J. H., F.R.S. Director of Botanic Gardens, Sydney, and Government Botanist, New South Wales. Botanic Gardens, Sydney
- 1913 Mather, J. F. 1 Mount Stuart Road, Hobart.
- 1895 *May, W. L. "Forest Hill," Sandford.
- 1909 Millen, J. D. Mount Bischoff Mine, Waratah.
- 1907 Miller, Lindsay S., M.B., Ch.B. 156 Macquarie Street, Hobart.
- 1894 L Mitchell, J. G. "Ellesmere," Jericho.
- 1913 Mitchell, P. H., B.A. Headmaster of the State High School, Hobart. 2 Ashfield Street, Queenborough.
- 1911 Montgomery, R. B. Park Street, New Town.
- 1882 Nicholas, G. C. "Cawcod," Ouse.
- 1910 Nicholls, H. Minchin. Government Microbiologist, Department of Agriculture. Macquarie Street, Hobart.
- 1908 Parsons, Miss S. R. 190 Davey Street, Hobart.
- 1902 *Piesse, Major E. L., B.Sc., LL.B. "Neika," Bay Road, New Town.
- 1910 Pillinger, James. 4 Fitzroy Crescent, Hobart.
- 1908 Pratt, A. W. Courtney. 11 Swan Street, Hobart.
- 1904 *Ritz, H. B., M.A. Lecturer in Modern Languages in the University of Tasmania. 40 Lochner Street, Hobart.
- 1864 Roberts, H. L. "Beaumaris," Montpelier Road, Hobart.
- 1884 *Rodway, Leonard. High Street, Queenborough.

Year of Election.		
1913		Ross, Hector. Sheriff of Tasmania. Elphinstone Road, Hobart.
		Ross, J. Head Teacher, New Town School, New Town.
1896		Scott, R. G., M.B., Ch.M. 172 Macquarie Street, Hobart.
1892	C	*Shirley, John, D.Sc. Inspector of Schools, Queensland. "Colarmie," Brunswick Street, New Farm, Brisbane.
1901		Shoobridge, Canon G. W. 3 Molle Street, Hobart.
1909		Simmons, M. W. A.M.P. Buildings, Elizabeth Street, Hobart.
1875		*Simson, Augustus. 49 High Street, Launceston
1901	C	Smith, R. Greig, D.Sc. Linnean Hall, Elizabeth Bay, Sydney.
1915		Smith, S. C., B.A. Hutchins School, Hobart.
1913		Smithies, John. Lindisfarne.
1896	L	*Sprott, Gregory, M.D., C.M. 134 Macquarie Street, Hobart.
1896	L	Sticht, Robert B.Sc., E.M. Mount Lyell Mining and Railway Co. Ltd., Queen Street, Melbourne.
1913		Susman, Maurice. 88 Murray Street, Hobart.
1907		Tarleton, J. W. 108 High Street, Queenborough.
1887		*Taylor, A. J. Librarian of the Tasmanian Public Library. 28 D'Arcy Street, Hobart.
1892	C	*Thomson, G. M., F.L.S. Dunedin, New Zealand.
1896		*Twelvetrees, W. H., F.G.S. Government Geologist. Geological Survey, Launceston.
1901	C	Wall, Arnold, M.A. Professor of English Language and Literature in Canterbury College. Christchurch, New Zealand.
1913		Wardman, John. Superintendent of the Botanical Gardens. Botanical Gardens, Hobart.
1913		Waterworth, Newham. Lindisfarne.
1902		Watson, Horace. 55 High Street, Queenborough.
1913		Wayn, Miss Lucy. "Fairfield," 246 Campbell Street, Hobart.

Year of
Election.

1912	*White, Arthur.	St. Cross, Harleston, Norfolk, England.
1915	Williams, Evan, B.Sc.	Friends' High School, Hobart.
1901	Wise, H. J.	4 Colville Street, Hobart.
1903	Wolfhagen, Waldemar.	Augusta Road, New Town.
1897	C Woodward, B. H., F.G.S.	Director of the Western Australian Museum and Art Gallery. Perth, Western Australia.

Members are asked to inform the Secretary of any change of address or other necessary correction.

ANNUAL REPORT.

In accordance with Rule 39, the Council present a Report on the proceedings of the Society during the year 1916.

The Council and Officers.

At the Annual General Meeting, held on 20th March, the following were elected members of the Council for the year:—Dr. A. H. Clarke, Messrs. L. Dechaineux, L. F. Giblin, H. Heaton, J. A. Johnson, L. H. Lindon, L. Rodway, Professor T. T. Flynn, and Dr. J. L. Glasson.

The Council, at its first meeting, elected the following officers:—Dr. Clarke (Chairman), Dr. Glasson (Honorary Secretary), Mr. Rodway (Honorary Treasurer), Mr. Dechaineux (Honorary Librarian), Mr. R. A. Black (Honorary Auditor).

The Council elected Dr. Clarke, Professor Flynn, Messrs. Lindon, Johnson, Dechaineux, and Rodway, to be trustees of the Tasmanian Museum and Botanical Gardens during the current year.

Ten ordinary meetings of the Council were called during the year 1916. The attendances of members were as follow:—Dr. Clarke, 9; Professor Flynn, 6; Mr. Dechaineux, 10; Mr. Giblin (on leave), 0; Mr. Heaton, 4; Mr. Johnson, 8; Mr. Lindon, 7; Mr. Rodway, 9; Dr. Glasson, 10.

Meetings of the Society.

Six Monthly General Meetings and one Special General Meetings were held, in addition to the Annual Meeting. Eight papers were read during the session, and several lectures were delivered by members and visitors.

Members.

During the year 5 new members were elected into the Society. We lost 23 members through death, resignation, or change of residence. The number of ordinary members at the end of the year was 88, life members 8, corresponding members 13, and honorary members 4.

Papers and Proceedings.

The Council has ordered 650 copies of the "Papers and Proceedings" for 1916. The Parliament of Tasmania has again approved of a grant of £100 in aid of the printing of the Society's Journal.

Library.

During the year 500 books and pamphlets were received, making a total of 12,500 in the Library on 31st December, 1916. The Council wishes to specially mention a donation of about 200 medical works from Dr. Wolfhagen.

Education Section.

President of Section, J. A. Johnson, Esq., M.A.

Secretary of Section, L. Dechaineux.

Membership, 15.

Six meetings of the Section were held, and the following papers read and discussed:— Messrs. Heaton and Dechaineux, "Education and Industry"; read again at May meeting of the Royal Society. Mr. H. Heaton, "Commercial Education." Mr. S. Clemes, Discussion on Professor Perry's paper, read at the British Association in Sydney. Mr. G. V. Brooks, "The Teaching of Literature in the Schools of South Australia." Mr. S. C. Smith "Education at the Royal Australian Naval College." Dr. Bottrill, "The Teachings of History."

Australian History and Economics Section.

Formed in May last, this Section has been unable to get really to work yet owing to the difficulty of finding a satisfactory date for meetings.

Membership, 11. Hon. Sec., H. Heaton.

Two meetings were held; the first for business purposes. At the second Mr. Heaton submitted a report as to the nature and extent of the Tasmanian MSS. housed in the Mitchell Library, Sydney. It was generally felt that the Section might take steps to persuade the Government to compile some form of catalogue of old MSS. now in the keeping of the various Government Departments.

RECEIPTS AND EXPENDITURE, 1916. GENERAL ACCOUNT.

RECEIPTS		EXPENDITURE.	
	£ s. d.		£ s. d.
Subscriptions—88 at £1/1/0	92 8 0	Attendant—	
Government Grant, 1915-16	100 0 0	Salary	£6 0 0
Payments for use of Society's Room	26 7 6	Extra Attendance	2 15 0
Sale of Publications	0 10 0		
Total	220 18 4	Papers and Proceedings—	
Debit Balance to 1917	17 9 8	1915—Printing	48 17 6
		Distribution	5 3 3
		1916—Printing	138 14 4
		Library—	
		Insurance	4 16 9
		Binding	1 7 0
		Clerical Assistance	2 2 0
		Purchase of Books	5 7 10
		Expenses of Meetings—	
		Notices and Advertising	11 5 0
		Light	1 16 0
		Miscellaneous—	
		Auditor	1 1 0
		Stamps	4 10 7
		Stationery	3 2 9
		Bank Charge and Cheque	
		Book	1 10 0
		Sundries	0 9 0
			10 13 4
			£238 18 0

MORTON ALLPORT MEMORIAL FUND ACCOUNT.

		£	s.	d.			£	s.	d.
1916.					Balance to 1917		20	9	3
Balance from 1915		10	14	3					
Interest Received from Perpetual Trustees		9	15	0					
		£20	9	3			£20	9	3

Audited and found correct,

R. A. BLACK,

Honorary Auditor.

J. L. GLASSON,

Honorary Secretary.

L. RODWAY,

Honorary Treasurer.

29/1/17.

Obituary.

GEOFFREY WATKINS SMITH.

In the Spring of 1907 Geoffrey Smith arrived in Tasmania for the purpose of working up our very interesting freshwater crustacea. He came with a brilliant record. Though only twenty-four years of age, his work on the Rhizocephala had already established his claim to world-wide recognition in the section of natural history to which he devoted his energy. He had already been elected Fellow and tutor of New College, Oxford.

From the very outset Smith, by his unassuming geniality and the rapidity with which he dropped into the ways of Australian students, gained the good wishes of those with whom he was brought into contact. Within a few days of arrival he joined us in a rough camp-out at Adventure Bay, where he made his first acquaintance with billy-tea and black snakes. He handled and bottled up a fine specimen of the latter without any of the reserve customary with those making their first acquaintance with these reptiles.

The crustacean which he had most desire to study was our interesting mountain shrimp, *Anaspides tasmaniae*, originally described by Geo. M. Thompson, of Dunedin. Smith spent several weeks on Mt. Wellington studying the shrimp in its native home, and the work he did is incorporated in his excellent memoir on "*Anaspidacea* living and fossil" published in 1909.

Smith worked hard during the few months he was with us. The Jordan, Lake St. Clair, and the Great Lake were, perhaps, his most successful hunting grounds. His most interesting find was a small shrimp allied to *Anaspides*, which he took in quantity in one bed of weed in the Great Lake. This animal, quite new to science, has never been taken anywhere else but in that one bed of weed. A little more than two years ago, when members of the British Association were here, we made a visit to the place, and captured a few hundred specimens in this spot. Smith described his find under the name *Paranaspides lacustris*.

On his return to England, Smith published papers on

the freshwater Crustacea of Tasmania and the freshwater Crayfishes of Australia, besides a fascinating little work, "A Naturalist in Tasmania." Then his field of research was greatly expanded and developed in the line of an experimental analysis of sex. We are told in "Nature, Aug. 17" of this year, that he had already published eleven memoirs on this subject, and also of the far-reaching research he was bringing to bear upon it, when to him, as to many other fine fellows, the end came suddenly, and robbed the world of the work of a master mind. The war broke out, and Geoff. Smith was amongst the first to offer his life to his country. His worth soon gained him a captaincy in the Rifle Brigade, and we who knew him here can well imagine the whole-souled manner in which he would do his duty. On July 10 of this year, in the fighting at the Somme, after his men had successfully taken a trench from the enemy, he was killed by a shell. Thus a life of brilliant promise was extinguished in the early portion of its career.

L. RODWAY.

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